

ENCYCLOPÆDIA BRITANNICA.

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D I A

Diamond.

DIAMOND, a genus of earths of the siliceous kind, called *Adamas Gemma* by the Latins, *Demant* by the Germans and Swedes, and *Diamant* by the French, is the hardest of all stones hitherto discovered; commonly clear or transparent; though this property may perhaps belong only to the crystals, and not to the rock from which they originate. When brought to Europe in its rough state, it is either in the form of roundish pebbles, with shining surfaces, or of octædral crystals; but though they generally appear in octædral forms, yet their crystals are frequently irregular, especially when the surface inclines to crystallize during the shooting of the whole crystal, and also when several of them unite in one group; in which case the one hinders the other from assuming a regular form. Mr Magellan, however, informs us, that diamonds sometimes assume other forms. He has seen a rough diamond in its native state, of a regular cubical form, with its angles truncated or cut off; likewise another belonging to Dr Combe of London, whose square sides were naturally joined by two very narrow long facets, forming angles of about 120 degrees; and the corners were quite perfect.

Though the diamond is commonly clear and pellucid, yet some of them are met with of a rose colour, or inclining to green, blue, or black, and some have black specks. Tavernier saw one in the treasury of the Mogul, with black specks in it, weighing about 56 carats; and he informs us, that yellow and black diamonds are produced in the mines at Carnatica. Mr Dutens also relates, that he saw a black diamond at Vienna in the collection of the prince de Lichtenstein. Some diamonds have a greenish crust; and of these M. Tavernier relates, that they burst into pieces while working into a proper shape, or in the very act of polishing on the wheel. In confirmation of this, he mentions a large diamond worth upwards of 5000 l. Sterling, which burst into nine pieces while polishing on the wheel at Venice.

The finest diamonds are those of a complexion like that of a drop of pure water. It is likewise a valuable property if they are of a regular form and truly made; as also that they be free from stains, spots, specks, flaws, and cross veins. If diamonds are tinged yellow, blue, green, or red, in a high degree, they are next in esteem; but if they are tinged with these colours only in a low degree, the value of them is greatly diminished. There are also diamonds of other complexions; such as brown, and those of a dark hue: the first resembling the brownest sugar-candy, and the latter dusky iron. In the *Philosophical Commerce of Arts*, Dr Lewis tells us of a *black* diamond that he himself had seen. At a distance, it looked uniformly

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black; but on closer examination appeared in some parts transparent, and in others charged with foulness, on which the black hue depended.

These gems are lamellated, consisting of very thin plates like those of talc, but very closely united; the direction of which must be found out by lapidaries before they can work them properly: Such as have their foliated substance not in a flat position, are called by the workmen *diamonds of nature*.

The names of *oriental* and *occidental*, given by jewelers to this and all other precious stones, have a different meaning from the obvious sense; the finest and hardest being always called *oriental*, whether they be produced in the east or not. Those called *occidental* are of inferior value; but according to Mr Jefferies, who has written a treatise on the subject, the diamonds of Brasil equal the finest oriental ones. The art of cutting these gems was invented in 1476 by Louis de Berquen a native of Bruges in the Austrian Netherlands. This stone becomes luminous in the dark, by exposure during a certain time to the rays of the sun; by heating it in a crucible; by plunging it in boiling water; or by rubbing it with a piece of glass. By friction it acquires an electrical property, by which it attracts the substance used for foils called *black mastic*, and other light matters. The author of the Chemical Dictionary says, that diamonds are refractory in the fire, and even apyrous. Nevertheless, experiments have been made, which prove that diamonds are capable of being dissipated, not only by the collected heat of the sun, but also by the heat of a furnace. Mr Boyle says, that he perceived certain acrid and penetrating exhalations from diamonds exposed to fire. A diamond by exposure to a concave speculum, the diameter of which was 40 inches, was reduced to an eighth part of its weight*. In the *Giornale de Letterati d'Italia*, tom. viii. art. 9. we may read a relation of experiments made on precious stones, by order of the grand duke of Tuscany, with a burning lens, the diameter of which was two thirds of a Florentine ell, near the focus of which was placed another smaller lens. By these experiments we find, that diamonds were more altered by solar heat than most of the other precious stones, although not the least appearance of a commencing fusion was observable. A diamond weighing 30 grains, thus exposed during 30 seconds, lost its colour, lustre, and transparency, and became of an opaque white. In five minutes, bubbles appeared on its surface; soon afterwards it burst into pieces, which were dissipated; and the small fragment which remained was capable of being crushed into fine powder by the pressure of the blade of a knife. Neither the addition of glass, flints, sulphur, metals, or salt of tartar, prevented this diffi-

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pation of diamonds, or occasioned any degree of fusion. By this heat rubies were softened, and lost some of their colour, but preserved their form and weight. By addition of a third lens, a further degree of fusion was given to rubies. Even then rubies could not be made to unite with glass. By having been exposed to this heat, the surface of the rubies which had suffered fusion, lost much of their original hardness, and were nearly as soft as crystal. But their internal parts, which had not been fused, retained their hardness. Emeralds by this heat were rendered white, or of various colours, and soon afterwards were fused. They were found to have lost part of their weight, and to be rendered less hard and brittle.

Experiments were also made by order of the emperor Francis I. on precious stones; from which we find, that diamonds were entirely dissipated by having been exposed in crucibles to a violent fire of a furnace during 24 hours; while rubies by the same heat were not altered in weight, colour, or polish. By exposing diamonds during two hours only at a time, the following alterations produced on them by fire were observed. First, they lost their polish; then they were split into thin plates; and, lastly, totally dissipated. By the same fire, emeralds were fused. See *Magasin de Hambourg*, tom. xviii.

The action of fire on diamonds has, notwithstanding the above mentioned experiments, been lately doubted in France; and the question has been agitated by several eminent chemists with much interest, and numerous experiments have been made which throw some light on the subject. M. D'Arcet found, not only that diamonds included in porcelain crucibles close, or covered with perforated lids, and exposed to the long and intense heat of a porcelain furnace, were perfectly dissipated; but also, that these stones could in a few hours be totally volatilised with a much inferior degree of heat, by exposing them in a coppel, under the muffle of an essay-furnace. In this latter experiment, he observed that the dissipation was gradual, and that it was effected by a kind of exfoliation. The dissipation of diamonds exposed in coppels was confirmed by M. Macquer; who further observed, that the diamonds were, before the dissipation began, rendered, by the fire, brilliant and shining, as it were, with a phosphoric light. In order to determine whether the dissipation of diamonds was actually effected by their reduction into vapour, or by a combustion or other effect of air upon them, Messrs Lavoisier, Macquer, and Cadet, exposed diamonds to intense heat in an earthen retort, during several hours, but without any other effect than that their polish was destroyed, and about $\frac{1}{4}$ th of their weight diminished. M. Mitouard put diamonds in a tobacco-pipe filled with pounded charcoal and accurately closed with lute. He further secured the diamonds from access of air or flame, by placing the tobacco-pipe in a crucible, to which another crucible was inverted and carefully luted. The diamonds, thus secluded from external air, having been exposed to the most intense heat which could be excited in a well constructed furnace, were not thereby altered or diminished. M. Mitouard was induced to believe, that the charcoal conducted to the preservation of diamonds not merely by excluding the air, but by some peculiar property, which he supposes may be the same as that by

which this substance defends metals from destruction by fire. He was confirmed in his opinion, by observing that diamonds were not preserved from the action of fire by surrounding them with powder of chalk and of calcined hartshorn, and including them in close vessels, so well as when the charcoal had been employed. Some chemists even thought that the perfect exclusion of air alone was sufficient to preserve diamonds, and doubted whether the balls and crucibles of porcelain employed by M. D'Arcet had excluded the air with sufficient accuracy. Indeed, in one of M. D'Arcet's own experiments, a diamond included in a ball of porcelain had resisted the action of fire. In order to ascertain this question, M. Cadet exposed diamonds in covered and luted crucibles to the violent heat of a forge during two hours; by which operation the diamonds lost only $\frac{1}{8}$ th part of their weight. He infers, that the destruction of diamonds by fire in open vessels is not a true volatilization; but merely an exfoliation, caused by the fire expanding the air contained between the thin plates of which these stones consist, and that by this exfoliation or decrepitation these plates are reduced to so fine a powder as to escape observation. M. D'Arcet objected against the experiments of his adversaries, that they were not of sufficient duration to decide against his, which had lasted several days. He renewed and multiplied his experiments, which confirmed him in his opinion of the volatilization of diamonds in vessels perfectly closed; and that this effect of fire on diamonds is not a mere exfoliation or mechanical separation of the plates of which these stones consist, he infers from the parts of the diamonds pervading the most solid porcelain crucibles without being perceptible, and from the luminous appearance first noticed by M. Macquer, and which was afterwards observed by M. Roux to be an actual flame.

Diamonds are found only in the East Indies, and in Brasil in South America. The diamond mines are found only in the kingdoms of Golconda, Visapour, Bengal, and the island of Borneo. There are four mines, or rather two mines and two rivers, whence diamonds are drawn. The mines are, 1. That of Raolconda, in the province of Carnatica, five days journey from Golconda, and eight from Visapour. It has been discovered about 200 years. 2. That of Gani, or Coulour, seven days journey from Golconda eastwardly. It was discovered 140 years ago by a peasant, who digging in the ground found a natural fragment of 25 carats. 3. That of Soumelpour, a large town in the kingdom of Bengal, near the Diamond-mine. This is the most ancient of them all: it should rather be called that of *Goual*, which is the name of the river, in the sand whereof these stones are found. Lastly, the fourth mine, or rather the second river, is that of Succudan, in the island of Borneo.

DIAMOND-Mine of Raolconda.—In the neighbourhood of this mine the earth is sandy, and full of rocks and copse. In these rocks are found several little veins of half and sometimes a whole inch broad, out of which the miners, with a kind of hooked irons, draw the sand or earth wherein the diamonds are; breaking the rocks when the vein terminates, that the track may be found again, and continued. When a sufficient quantity of earth or sand is drawn forth, they wash it two or three times, to separate the stones therefrom.

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Diamond. from. The miners work quite naked, except for a thin linen cloth before them; and besides this precaution, have likewise inspectors, to prevent their concealing of stones: which, however, maugre all this care, they frequently find means to do, by watching opportunities when they are not observed, and swallowing them down.

DIAMOND-Mine of Gani or Coulour.—In this mine are found a great number of stones from 10 to 40 carats, and even more; and it was here that famous diamond of Aureng-Zeb the Great Mogul, which before it was cut weighed 793 carats, was found. The stones of this mine are not very clear; their water is usually tinged with the quality of the soil; being black where that is marshy, red where it partakes of red, sometimes green and yellow, if the ground happen to be of those colours. Another defect of some consequence is a kind of greasiness appearing on the diamond, when cut, which takes off part of its lustre.—There are usually no less than 60,000 persons, men, women, and children, at work in this mine.

When the miners have found a place where they intend to dig, they level another somewhat bigger in the neighbourhood thereof, and inclose it with walls about two feet high, only leaving apertures from space to space, to give passage to the water. After a few superstitious ceremonies, and a kind of feast which the master of the mine makes for the workmen, to encourage them, every one goes to his business, the men digging the earth in the place first discovered, and the women and children carrying it off into the other walled round. They dig 12 or 14 feet deep, and till such time as they find water. Then they cease digging; and the water thus found serves to wash the earth two or three times, after which it is let out at an aperture reserved for that end. This earth being well washed, and well dried, they sift it in a kind of open sieve, or riddle, much as we do corn in Europe; then thrash it, and sift it afresh; and lastly, search it well with the hands to find the diamonds. They work naked as in the mine of Raolconda, and are watched after the like manner by inspectors.

DIAMOND-Mine of Soumelpour, or river Goual.—Soumelpour is a large town built all of earth, and covered with branches of cacao-trees: the river Goual runs by the foot thereof, in its passing from the high mountains towards the south to the Ganges, where it loses its name. It is from this river that all our fine diamond points, or sparks, called *natural sparks*, are brought. They never begin to seek for diamonds in this river till after the great rains are over, that is, after the month of December; and they usually even wait till the water is grown clear, which is not before January. The season at hand, eight or ten thousand persons, of all ages and sexes, come out of Soumelpour and the neighbouring villages. The most experienced among them search and examine the sand of the river, going up it from Soumelpour to the very mountain whence it springs. A great sign that there are diamonds in it, is the finding of those stones which the Europeans call *thunder-stones*. When all the sand of the river, which at that time is very low, has been well examined, they proceed to take up that wherein they judge diamonds likely to be found; which is done after the following manner: They dam the place

round with stones, earth, and fascines, and lading out the water, dig about two feet deep: the sand thus got is carried into a place walled round on the bank of the river. The rest is performed after the same manner as at Coulour, and the workmen are watched with equal strictness.

DIAMOND-Mine in the island of Borneo, or river of Succudan.—We are but little acquainted with this mine; the queen who reigns in that part of the island not allowing strangers to have any commerce in these stones: though there are very fine ones to be bought at Batavia, brought thither by stealth. They were anciently imagined to be softer than those of the other mines; but experience shows they are in no respect inferior to them.

Beside these four diamond-mines, there have been two others discovered; one of them between Coulour and Raolconda, and the other in the province of Carnatica; but they were both closed up almost as soon as discovered: that of Carnatica, because the water of the diamonds was always either black or yellow; and the other, on account of their cracking, and flying in pieces when cut and ground.

The diamond, we have already observed, is the hardest of all precious stones. It can only be cut and ground by itself and its own substance. To bring it to that perfection which augments its price so considerably, they begin by rubbing several against each other, while rough; after having first glued them to the ends of two wooden blocks, thick enough to be held in the hand. It is this powder thus rubbed off the stones, and received in a little box for the purpose, that serves to grind and polish the stones.

Diamonds are cut and polished by means of a mill, which turns a wheel of soft iron sprinkled over with diamond-dust mixed with oil of olives. The same dust, well ground, and diluted with water and vinegar, is used in the sawing of diamonds; which is performed with an iron or brass wire, as fine as a hair. Sometimes, in lieu of sawing the diamonds, they cleave them, especially if there be any large shivers therein. But the Europeans are not usually daring or expert enough to run the risk of cleaving, for fear of breaking.

The *first water* in diamonds means the greatest purity and perfection of their complexion, which ought to be that of the purest water. When diamonds fall short of this perfection, they are said to be of the *second* or *third water*, &c. till the stone may be properly called a *coloured one*: for it would be an impropriety to speak of an imperfectly coloured diamond, or one that has other defects, as a stone of a bad water only.

Mr Boyle has observed, from a person much conversant in diamonds, that some of these gems, in their rough state, were much heavier than others of the same bigness, especially if they were cloudy or foul; and Mr Boyle mentions one that weighed $8\frac{1}{2}$ grains, which being carefully weighed in water, proved to an equal bulk of that liquor as $2\frac{2}{3}$ to 1. So that, as far as could be judged by that experiment, a diamond weighs not thrice as much as water: and yet, in his table of specific gravities, that of a diamond is said to be to water as 3400 to 1000; that is, as $3\frac{2}{3}$ to 1; and therefore, according to these two accounts, there should be some diamonds whose specific gravity differs nearly $\frac{1}{3}$ from that of others. But this is a much greater dif-

Diamond. ference than can be expected in two bodies of the same species; and indeed, on an accurate trial, does not prove to be the case with diamonds. The Brasil diamonds differ a little in weight one from another, and greatly vary from the standard set by Mr Boyle for the specific gravity of this gem in general; two large diamonds from that part of the world being carefully weighed, one was found as 3518, the other as 3521, the specific gravity of water being reckoned 1000. After this, ten East India diamonds were chosen out of a large parcel, each as different from the other in shape, colour, &c. as could be found. These being weighed in the same scales and water with the former, the lightest proved as 3512, the heaviest as 3525, still supposing the water to be 1000.—Mr Elliott, who made these experiments, has drawn out a table of their several differences, which is done with great care and accuracy; and, taking in all the common varieties in diamonds, may serve as a general rule for their mean gravity and differences.

Water	In air.		Specific gravity
	Grains.	Grains.	
No 1. A Brasil diamond, fine water and rough coat	92,425	66,16	3518
2. Ditto, fine water, rough coat	88,21	63,16	3521
3. Ditto, fine bright coat	10,025	7,170	3511
4. Ditto, fine bright coat	9,560	6,830	3501
5. An East India diamond, pale blue	26,485	18,945	3512
6. Ditto, bright yellow	23,33	16,710	3524
7. Ditto, very fine water, bright coat	20,66	14,800	3525
8. Ditto, very bad water, honeycomb coat	20,38	14,590	3519
9. Ditto, very hard bluish cast	22,5	16,1	3515
10. Ditto, very soft, good water	22,615	16,2	3525
11. Ditto, a very large red foulness in it	25,480	18,230	3514
12. Ditto, soft, bad water	29,525	21,140	3521
13. Ditto, soft, brown coat	26,535	18,990	3516
14. Ditto, very deep green coat	25,250	18,080	3521
The mean specific gravity of the Brasil diamonds appears to be	-	-	3513
Of the East India diamonds	-	-	3519
The mean of both	-	-	3517

Therefore if any thing is to be concluded as to the specific gravity of the diamond, it is, that it is to water as 3517 to 1000.

For the valuation of diamonds of all weights, Mr Jefferies lays down the following rule. He first supposes the value of a rough diamond to be settled at 2 l. per carat, at a medium; then to find the value of diamonds of greater weights, multiply the square of their weight by 2, and the product is the value required. *E. G.* to find the value of a rough diamond of two carats; $2 \times 2 = 4$, the square of the weight; which, multiplied by two, gives 8 l. the true value of a rough diamond of two carats. For finding the value of manufactured diamonds, he supposes half their weight to be lost in manufacturing them; and therefore, to find their

value, we must multiply the square of double their weight by 2, which will give their true value in pounds. Thus, to find the value of a wrought diamond weighing two carats; we first find the square of double the weight, viz $4 \times 4 = 16$; then $16 \times 2 = 32$. So that the true value of a wrought diamond of two carats is 32 l. On these principles Mr Jefferies has constructed tables of the price of diamonds from 1 to 100 carats.

The greatest diamond ever known in the world is one belonging to the king of Portugal, which was found in Brasil. It is still uncut: and Mr Magellan informs us, that it was of a larger size; but a piece was cleaved or broken off by the ignorant countryman, who chanced to find this great gem, and tried its hardness by the stroke of a large hammer upon the anvil.

This prodigious diamond weighs 1680 carats: and although it is uncut, Mr Romè de l'Isle says, that it is valued at 224 millions sterling; which gives the estimation of 79,36 or about 80 pounds sterling for each carat: viz. for the multiplicand of the square of its whole weight. But even in case of any error of the press in this valuation, if we employ the general rule above mentioned, this great gem must be worth at least 5,644,800 pounds sterling, which are the product of 1680 by two pounds, viz. much above five millions and a half sterling.

The famous diamond which adorns the sceptre of the Empress of Russia under the eagle at the top of it weighs 779 carats, and is worth at least 4,854,728 pounds sterling, although it hardly cost 135,417 guineas. This diamond was one of the eyes of a Malabar idol, named *Scheringham*. A French grenadier, who had deserted from the Indian service, contrived so well as to become one of the priests of that idol, from which he had the opportunity to steal its eye: he run away to the English at Trichinaputy, and thence to Madras. A ship-captain bought it for twenty thousand rupees: afterwards a Jew gave seventeen or eighteen thousand pounds sterling for it: at last a Greek merchant, named *Gregory Suffras*, offered it to sale at Amsterdam in the year 1766: and the late prince Orloff made this acquisition, as he himself told Mr Magellan in London, for his sovereign the empress of Russia. Dutens, page 19. and Bomare, page 389. of his Mineralogy, relate the above anecdote. The figure and size of this diamond may be seen in the British Museum in London: it is far from being of a regular form.

The diamond of the great Mogul is cut in Rose; weighs 279 $\frac{1}{8}$ carats, and it is worth 380,000 guineas. This diamond has a small flaw underneath near the bottom: and Tavernier, page 389. who examined it, valued the carat at 150 French livres. Before this diamond was cut, it weighed 793 $\frac{1}{8}$ carats, according to Romè de l'Isle: but Tavernier, page 339. of his second volume, says, that it weighed 900 carats before it was cut. If this is the very same diamond, its loss by being cut was very extraordinary.

Another diamond of the king of Portugal, which weighs 215 carats, is extremely fine, and is worth at least 369,800 guineas.

The diamond of the grand duke of Tuscany, now of the emperor of Germany, weighs 139 $\frac{1}{2}$ carats; and is worth at least 109,520 guineas. Tavernier says, that

Diamond. that this diamond has a little hue of a citron colour; and he valued it at 135 *livres tournoises* the carat. Robert de Berquen says, that this diamond was cut into two: that the grand Turk had another of the same size: and that there were at Bijnagar two large diamonds, one of 250 and another of 140 carats. This Robert de Berquen was the grandson of Louis de Berquen, who invented the art of cutting diamonds.

The diamond of the king of France, called the *Pitt* or *Regent*, weighs 136½ carats: this gem is worth at least 208,333 guineas, although it did not cost above the half of this value.

The other diamond of the same monarch, called the *Sancy*, weighs 55 carats: it cost 25,000 guineas: and Mr Dutens says, that it is worth much above that price.

Brilliant DIAMOND, is that cut in faces both at top and bottom; and whose table, or principal face at top, is flat. To make a complete square brilliant, if the rough diamond be not found of a square figure, it must be made so; and if the work is perfectly executed, the length of the axis will be equal to the side of the square base of the pyramid.—Jewellers then form the table and collet by dividing the block, or length of the axis, into 18 parts. They take $\frac{5}{8}$ from the upper part, and $\frac{1}{8}$ from the lower. This gives a plane at $\frac{4}{8}$ distance from the girdle for the table; and a smaller plane at $\frac{5}{8}$ distance for the collet; the breadth of which will be $\frac{1}{3}$ of the breadth of the table. In this state the stone is said to be a *complete square table diamond*.—The brilliant is an improvement on the table-diamond, and was introduced within the last century, according to Mr Jefferies.—To render a brilliant perfect, each corner of the above described table-diamond, must be shortened by $\frac{1}{10}$ of its original. The corner ribs of the upper sides must be flattened, or run towards the centre of the table $\frac{1}{6}$ less than the sides; the lower part, which terminates in the girdle, must be $\frac{1}{6}$ of one side of the girdle; and each corner rib of the under sides must be flattened at the top, to answer the above flattening at the girdle, and at bottom must be $\frac{1}{4}$ of each side of the collet.

The parts of the small work which completes the brilliant, or the star and skill facets, are of a triangular figure. Both of these partake equally of the depth of the upper sides from the table to the girdle; and meet in the middle of each side of the table and girdle, as also at the corners. Thus they produce regular lozenges on the four upper sides and corners of the stone. The triangular facets, on the under sides, joining to the girdle, must be half as deep again as the above facets, to answer to the collet part.—The stone here described is said to be a *full-substantiated brilliant*.—If the stone is thicker than in the proportion here mentioned, it is said to be an *over-weighted brilliant*.—If the thickness is less than in this proportion, it is called a *spread-brilliant*.—The beauty of brilliants is diminished from their being either over-weighted or spread. The true proportion of the axis, or depth of the stone to its side, is as 2 to 3.—Brilliants are distinguished into square, round, oval, and drops, from the figure of their respective girdles.

Cornish DIAMOND, a name given by many people to the crystals found in digging the mines of tin in Corn-

wal. These crystals are of the nature of the Kerry-stone of Ireland, but somewhat inferior to it: they are usually bright and clear, except towards the root, where they are coarse and foul, or whitish. They are usually found in the common form of an hexangular column terminated at each end by an hexangular pyramid.

Rose-DIAMOND is one that is quite flat underneath, with its upper part cut in divers little faces, usually triangles, the uppermost of which terminate in a point.—In rose-diamonds, the depth of the stone from the base to the point must be half the breadth of the diameter of the base of the stone. The diameter of the crown must be $\frac{2}{3}$ of the diameter of the base. The perpendicular, from the base to the crown, must be $\frac{1}{3}$ of the diameter of the stone. The lozenges which appear in all circular rose-diamonds, will be equally divided by the ribs that form the crown; and the upper angles or facets will terminate in the extreme point of the stone, and the lower in the base or girdle.

Rough DIAMOND, is the stone as nature produces it in the mines.

A rough diamond must be chosen uniform, of a good shape, transparent, not quite white, and free of flaws and shivers. Black, rugged, dirty, flawey, veiny stones, and all such as are not fit for cutting, they use to pound in a steel mortar made for that purpose; and when pulverized, they serve to saw, cut, and polish the rest. Shivers are occasioned in diamonds by this, That the miners, to get them more easily out of the vein, which winds between two rocks, break the rocks with huge iron levers, which shakes, and fills the stone with cracks and shivers. The ancients had two mistaken notions with regard to the diamond: the first, that it became soft, by steeping it in hot goat's blood; and the second, that it is malleable, and bears the hammer. Experience shows us the contrary; there being nothing capable of mollifying the hardness of this stone; tho' its hardness be not such, that it will endure being struck at pleasure with the hammer.

Facitious DIAMONDS. Attempts have been made to produce artificial diamonds, but with no great success.—These made in France, called *temple diamonds*, on account of the temple at Paris, where the best of them are made, fall vastly short of the genuine ones; accordingly they are but little valued, though the consumption thereof is pretty considerable for the habits of the actors on the stage, &c. See *PASTES*.

DIAMOND, in the glass-trade, an instrument used for squaring the large plates or pieces; and, among glaziers, for cutting their glass.

These sorts of diamonds are differently fitted up. That used for large pieces, as looking-glasses, &c. is set in an iron ferril, about two inches long, and a quarter of an inch in diameter; the cavity of the ferril being filled up with lead, to keep the diamond firm: there is also a handle of box or ebony fitted to the ferril, for holding it by.

DIAMOND, in heraldry, a term used for expressing the black colour in the achievements of peerage.

Guillim does not approve of blazoning the coats of peers by precious stones instead of metals and colours; but the English practice allows it. Morgan says the diamond is an emblem of fortitude.

DIANA, the goddess of hunting. According to Cicero,

*Diamond,
Diana.*

Diana.

Cicero, there were three of this name: a daughter of Jupiter and Proserpine, who became mother of Cupid; a daughter of Jupiter and Latona; and a daughter of Upis and Glaucus. The second is the most celebrated, and to her all the ancients allude. She was born at the same birth as Apollo; and the pains which she saw her mother suffer during her labour gave her such an aversion to marriage, that she obtained of her father to live in perpetual celibacy, and to preside over the travails of women. To shun the society of men, she devoted herself to hunting; and was always accompanied by a number of chosen virgins, who like herself abjured the use of marriage. She is represented with a quiver and attended with dogs, and sometimes drawn in a chariot by two white flags. Sometimes she appears with wings, holding a lion in one hand and a panther in the other, with a chariot drawn by two heifers, or two horses of different colours. She is represented as tall; her face has something manly; her legs are bare, well shaped, and strong; and her feet are covered with a buskin worn by huntresses among the ancients. She received many surnames, particularly from the places where her worship was established, and from the functions over which she presided. She was called *Lucina*, *Ilybia*, or *Juno Pronuba*, when invoked by women in childbed; and *Trivia* when worshipped in the cross-ways, where her statues were generally erected. She was supposed to be the same as the moon and Proserpine or Hecate, and from that circumstance she was called *Triformis*; and some of her statues represented her with three heads, that of a horse, a dog, and a boar. Her power and functions under these three characters have been beautifully expressed in these two verses:

*Terræ, lustrat, agit, Proserpina, Luna, Diana,
Ima, suprema, feras, sceptro, fulgore, sagittâ.*

She was also called *Agrotera*, *Orithia*, *Taurica*, *Delia*, *Cynthia*, *Aricia*, &c. She was supposed to be the same as the Isis of the Egyptians, whose worship was introduced into Greece with that of Osiris under the name of Apollo. When Typhon waged war against the gods, Diana metamorphosed herself into a cat to avoid his fury. She is generally known, in the figures that represent her, by the crescent on her head, by the dogs which attend her, and by her hunting habit. The most famous of her temples was that of Ephesus, which was one of the seven wonders of the world: (See *EPHESUS*). She was there represented with a great number of breasts, and other symbols which signified the earth or Cybele. Though she was the patroness of chastity, yet she forgot her dignity to enjoy the company of Endymion, and the very familiar favours which she granted to Pan and Orion are well known: (See *ENDYMION*, *PAN*, *ORION*). The inhabitants of Taurica were particularly attached to the worship of this goddess, and they cruelly offered on her altar all the strangers that were shipwrecked on their coasts. Her temple in Aricia was served by a priest who had always murdered his predecessor; and the Lacedæmonians yearly offered her human victims till the age of Lycurgus, who changed this barbarous custom for the sacrifice of flagellation. The Athenians generally offered her goats; and others a white kid, and sometimes a boar pig or an ox. Among plants, the poppy and the ditamy were sacred to her. She, as well as her

brother Apollo, had some oracles; among which those of Egypt, Cilicia, and Ephesus, are the most known.

DIANÆ ARBOR, or *ARBOR LUNÆ*, in chemistry, the beautiful crystallizations of silver, dissolved in aquafortis, to which some quicksilver is added: and so called from their resembling the trunk, branches, leaves, &c. of a tree. See *CHEMISTRY*, n° 754.

DIANÆ Fanum, (anc. geog.), a promontory of Bithynia: Now *Scutari*, a citadel opposite to Constantinople, on the east side of the Bosphorus Thracius.

DIANÆ Portus, a port of Corfica, situated between Aleria and Mariana, on the east side.

DIANDRIA (from *dis* twice, and *anēr* a man), the name of the second class in Linnæus's sexual system, consisting of hermaphrodite plants; which, as the name imports, have flowers with two stamina or male organs.

The orders in this class are three, derived from the number of styles or female parts. Most plants with two stamina have one style; as jessamine, lilac, privet, veronica, and bastard alaternus: vernal grass has two styles; pepper, three.

DIANIUM (anc. geog.), a town of the Contestani, in the Hither Spain; famous for a temple of Diana, whence the name: Now *Denia*, a small town of Valencia, on the Mediterranean. Also a promontory near Dianium: Now *El Cabo Martin*, four leagues from Denia, running out into the Mediterranean.

DIANTHERA, in botany: A genus of the monogynia order, belonging to the diandria class of plants; and in the natural method ranking under the 40th order, *Personate*. The corolla is ringent; the capsule bilocular, parting with a spring at the heel; the stamina each furnished with two antheræ placed alternately.—There is only one species, a native of Virginia and other parts of North America. It is a low herbaceous plant, with a perennial root, sending out upright stalks a foot high, garnished with long narrow leaves of an aromatic odour, standing close to the stalks. From the side of the stalks the footstalks of the flowers are produced, sustaining small spikes of flowers.—This plant is very difficult to be preserved in Britain; for though it is hardy enough to live in the open air, it is very subject to rot in winter. It may be propagated by seeds sown on a gentle hot-bed; and in the winter the plants must be kept in a dry stove.

DIANTHUS, CLOVE-GILLIFLOWER, CARNATION, PINK, SWEET-WILLIAM, &c.: A genus of the digynia order, belonging to the decandria class of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx is cylindrical and monophyllous, with four scales at the base. There are five petals, with narrow heels; the capsule is cylindrical and unilocular.—There are a great number of species; but not more than four that have any considerable beauty as garden-flowers, each of which furnishes some beautiful varieties. 1. The caryophyllus, or clove-gilliflower, including all the varieties of carnation. It rises with many short trailing shoots from the root, garnished with long, very narrow, evergreen leaves; and amidst them upright slender flower-stalks, from one to three feet high, emitting many side-shoots; all of which, as well as the main stalk, are terminated by large solitary flowers, having short oval scales to the calyx, and crenated petals. The varieties of this are very numerous,

Dianthus. rous, and unlimited in the diversity of flowers. 2. The deltoides, or common pink, rises with numerous short leafy shoots crowning the root, in a tufted head close to the ground, closely garnished with small narrow leaves; and from the ends of the shoots many erect flower-stalks, from about six to 15 inches high, terminated by solitary flowers of different colours, single and double, and sometimes finely variegated. This species is perennial, as all the varieties of it commonly cultivated also are. 3. The Chinenfis, Chinese, or Indian pink, is an annual plant with upright firm flower-stalks, branching erect on every side, a foot or 15 inches high, having all the branches terminated by solitary flowers of different colours and variegations, appearing from July to November. 4. The barbatus, or bearded dianthus, commonly called *sweet-william*. This rises with many thick leafy shoots, crowning the root in a cluster close to the ground; garnished with spear-shaped evergreen leaves, from half an inch to two inches broad. The stems are upright and firm, branching erect two or three feet high, having all the branches and main stem crowned by numerous flowers in aggregate clusters of different colours and variegations.

Culture. Though the carnations grow freely in almost any garden earth, and in it produce beautiful flowers, yet they are generally superior in that of a light loamy nature: and of this kind of soil the florists generally prepare a kind of compost in the following manner, especially for those fine varieties which they keep in pots. A quantity of loamy earth must be provided, of a light sandy temperature, from an upland or dry pasture-field or common, taking the top spit turf and all, which must be laid in a heap for a year, and turned over frequently. It must then be mixed with about one-third of rotten dung of old hot-beds, or rotten neats dung, and a little sea-sand, forming the whole into a heap again, to lie three, four, or six months, at which time it will be excellent for use; and if one parcel or heap was mixed with one of these kinds of dungs, and another parcel with the other, it will make a change, and may be found very beneficial in promoting the size of the flowers. This compost, or any other made use of for the purpose, should not be sifted, but only well broken with the spade and hands.—When great quantities of carnations are required, either to furnish large grounds, or for market, or when it is intended to raise new varieties, it is easily effected by sowing some seed annually in spring, in common earth, from which the plants will rise abundantly. Several good varieties may also be expected from the plants of each sowing; and possibly not one exactly like those from which the seed was saved. The single flowers are always more numerous than the double ones; but it is from the latter only that we are to select our varieties. The season for sowing the seed is any time from the 20th of March to the 15th of April.—The plants generally come up in a month after sowing: they must be occasionally weeded and watered till July, when they will be fit for transplanting into the nursery beds. These beds must be made about three feet wide, in an open situation; and taking advantage of moist weather, prick the plants therein four inches asunder, and finish with a gentle watering, which repeat occasionally till the plants have taken good root. Here they must remain till September, when they will

be so well advanced in growth as to require more room; and should then have their final transplantation into other three feet wide beds of good earth, in rows 9 inches asunder, where they are to be placed in the order of quincunx. Here they are to remain all winter, until they flower, and have obtained an increase of the approved varieties of doubles by layers; and until this period, all the culture they require is, that if the winter should prove very severe, an occasional shelter of mats will be of advantage. In spring, the ground must be loosened with a hoe; they must be kept clear from weeds; and when the flower-stalks advance, they are to be tied up to sticks, especially all those that promise by their large flower-pods to be doubles.

The only certain method of propagating the double varieties is by layers. The proper parts for layers are those leafy shoots arising near the crown of the root, which, when about five, six, or eight inches long, are of a proper degree of growth for layers. The general season for this work is June, July, and the beginning of August, as then the shoots will be arrived at a proper growth for that operation; and the sooner it is done after the shoots are ready the better, that they may have sufficient time to acquire strength before winter: these laid in June and July will be fit to take off in August and September, so will form fine plants in the month of October. The method of performing the work is as follows. First provide a quantity of small hooked sticks for pegs. They must be three or four inches long, and their use is to peg the layers down to the ground. Get ready also in a barrow a quantity of light rich mould, to raise the earth, if necessary, round each plant, and provide also a sharp penknife. The work is begun by stripping off all the leaves from the body of the shoots, and shortening those at top an inch or two evenly. Then choosing a strong joint on the middle of the shoot or thereabouts, and on the back or under side thereof, cut with the penknife the joint half-way through, directing your knife upward so as to slit the joint up the middle, almost to the next joint above, by which you form a kind of tongue on the back of the shoot; observing that the swelling skinny part of the joint remaining at the bottom of the tongue must be trimmed off, that nothing may obstruct the issuing of the fibres; for the layers always form their roots at that part. This done, loosen the earth about the plant; and, if necessary, add some fresh mould, to raise it for the more ready reception of the layers; then with your finger make a hollow or drill in the earth to receive the layer; which bend horizontally into the opening, raising the top upright, so as to keep the gash or slit part of the layer open; and, with one of the hooked sticks, peg down the body of the layer, to secure it in its proper place and position, still preserving the top erect and the slit open, and draw the earth over it an inch or two, bringing it close about the erect part of the shoot; and when all the shoots of each plant are thus laid, give directly some water to settle the earth close, and the work is finished. In dry weather the waterings must be often repeated, and in five or six weeks the layers will have formed good roots. They must then be separated with a knife from the old plant, gently raised out of the earth with the point of a knife or trowel, in order to preserve the fibrous roots of the layers as entire

Dianthus.

Dianthus,
Diapason.

tire as possible; and when thus taken up, cut off the naked sticky part at bottom close to the root, and trim the tops of the leaves a little. They are then ready for planting either into beds or pots. In November the fine varieties in pots should be moved to a sunny sheltered situation for the winter; and if placed in a frame, to have occasional protection from hard frost, it will be of much advantage. In the latter end of February, or some time in March, the layers in the small pots, or such as are in beds, should be transplanted with balls into the large pots, where they are to remain for flower. To have as large flowers as possible, curious florists clear off all side-shoots from the flower-stem, suffering only the main or top buds to remain for flowering. When the flowers begin to open, attendance should be given to assist the fine varieties, to promote their regular expansion, particularly the largest kinds called *burstlers*, whose flowers are sometimes three or four inches diameter. Unless these are assisted by art, they are apt to burst open on one side, in which case the flower will become very irregular: therefore, attending every day at that period, observe, as soon as the calyx begins to break, to cut it a little open at two other places in the indenting at top with narrow-pointed scissars, and hereby the more regular expansion of the petals will be promoted: observing, if one side of any flower comes out faster than another, to turn the pot about, that the other side of the flower may be next the sun, which will also greatly promote its regular expansion. When any fine flower is to be blown as large and spreading as possible, florists place spreading paper collars round the bottom of the flowers, on which they may spread their petals to the utmost expansion. These collars are made of stiff white paper, cut circular about three or four inches over, having a hole in the middle to receive the bottom of the flower, and one side cut open to admit it. This is to be placed round the bottom of the petals in the inside of the calyx, the leaves of which are made to spread flat for its support. The petals must then be drawn out and spread upon the collar to their full width and extent; the longest ones undermost, and the next longest upon these; and so on; observing that the collar must nowhere appear wider than the flower; and thus a carnation may be rendered very large and handsome.

These directions will answer equally well for the propagation of the pinks and sweet-williams, though neither of these require such nicety in their culture as the carnations.

DIAPASON, in music, a musical interval, by which most authors who have wrote on the theory of music use to express the OCTAVE of the Greeks.

DIAPASON, among the musical instrument-makers, a kind of rule or scale whereby they adjust the pipes of their organs, and cut the holes of their hautboys, flutes, &c. in due proportion for performing the tones, semitones, and concords, just.

DIAPASON-Diaex, in music, a kind of compound concord, whereof there are two sorts; the greater, which is in the proportion of 10-3; and the lesser, in that of 16-5.

DIAPASON Diapente, in music, a compound consonance in a triple ratio, as 3-9. This interval, says Martianus Capella, consists of 9 tones and a semitone; 19 semitones, and 38 dieses. It is a symphony made

Nº 101.

when the voice proceeds from the first to the twelfth Diapason sound.

DIAPASON Diatessaron, in music, a compound concord founded on the proportion of 8 to 3. To this interval Martianus Capella allows 8 tones and a semitone; 17 semitones, and 34 dieses. This is when the voice proceeds from its first to its eleventh sound. The moderns would rather call it the *eleventh*.

DIAPASON Ditone, in music, a compound concord, whose terms are as 10-4, or as 5-2.

DIAPASON Semiditone, in music, a compound concord, whose terms are in the proportion of 12-5.

DIAPEDESIS, in medicine, a transfusion of the fluids through the sides of the vessels that contain them, occasioned by the blood's becoming too much attenuated, or the pores becoming too patent.

DIAPENTE, in the ancient music, an interval marking the second of the concords, and with the diatessaron an octave. This is what in the modern music is called a *fifth*.

DIAPHANOUS, an appellation given to all transparent bodies, or such as transmit the rays of light.

DIAPHORESIS, in medicine, an elimination of the humours in any part of the body through the pores of the skin. See PERSPIRATION.

DIAPHORETICS, among physicians, all medicines which promote perspiration.

DIAPHRAGM, **DIAPHRAGMA**, in anatomy, a part popularly called the *midriff*, and by anatomists *septum transversum*. It is a nervous muscle, separating the breast or thorax from the abdomen or lower venter, and serving as a partition between the natural and the vital parts, as they are called. See ANATOMY, Nº 115.

It was Plato, as Galen informs us, that first called it *diaphragm*, from the verb διαφραττειν, *to separate or be between two*. Till his time it had been called *φρενις*, from a notion that an inflammation of this part produced phrensy; which is not at all warranted by experience, any more than that other tradition, that a transverse section of the diaphragm with a sword causes the patient to die laughing.

DIAPORESIS, διαπορησις, in rhetoric, is used to express the hesitation or uncertainty of the speaker.

We have an example in Homer, where Ulysses, going to relate his sufferings to Alcinous, begins thus:

Τι πρῶτον, τι δ' ἐπεία, τι δ' ὕστατον καταλέξω;
Quid primum, quid deinde, quid postremo alloquar?

This figure is most naturally placed in the exordium or introduction to a discourse. See DOUBTING.

DIARBECK, or **DIARBEKR**, an extensive province of Eastern Asiatic Turkey; comprehending, in its latest extent, *Diarbekr*, properly so called, *Terack* or *Chaldea*, and *Curdistan*, which were the ancient countries of Mesopotamia, Chaldea, and Assyria, with Babylon. It is called *Diarbeck*, *Diarbeker*, or *Diarbekr*, as signifying the "duke's country," from the word *dhyar* "a duke, and *bekr* "country." It extends along the banks of the Tigris and Euphrates from north-north-west to south-east, that is, from Mount Taurus, which divides it from Turcomania on the north, to the inmost recess of the Persian gulph on the south, about 600 miles; and from east to west, that is, from Persia on the east to Syria and Arabia Deserta on the west, in some places 200, and in others about 300, miles, but

Diapason
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Diarbeck.

Diarbekir. but in the southern or lower parts not above 150. As extending also from the 30th to the 38th degree of latitude, it lies under part of the fifth and sixth climates whose longest day is about 14 hours and a half, and so in proportion, and consequently enjoys a good temperature of air, as well as, in the greater part of it, a rich and fertile soil. There are indeed, as in all hot countries, some large deserts in it, which produce no sustenance for men or cattle, nor have any inhabitants. Being a considerable frontier towards the kingdom of Persia, it is very well guarded and fortified; but as for those many cities once so renowned for their greatness and opulence, they are at present almost dwindled into heaps of ruins. Bagdad, Mossul, Carahmed, and a few more, indeed continue to be populous and wealthy; but the rest can scarce be called by any other name than that of sorry places. The rivers Euphrates and Tigris have almost their whole course through this country.

Diarbeck Proper is bounded on the north by Turcomania, on the west by Syria, on the south by part of Arabia Deserta and Yrack Proper, and on the east by Curdistan. It was named by Moses *Padan Aram*; the latter being the general name of Syria; and the former signifying *fruitful*, a proper epithet for this country, which is really so to a very high degree, especially on the northern side, where it yields corn, wine, oil, fruits, and all necessaries of life in great abundance. Formerly it was the residence of many famed patriarchs, yet was over-run with the grossest idolatry, not only in the time of Abraham's coming out of it, and Jacob's sojourning in it, but likewise during the time it continued under the dominion of the Assyrians, Babylonians, Medes, Persians, and Romans. It received indeed the light of the gospel soon after our Saviour's ascension, from St Thaddæus, who is said to have been sent thither by St Thomas, at the request of Agbarus king of Edessa. This account, together with that monarch's letter to Jesus Christ, we have from Eusebius, who took it from the archives of that city; and the whole had passed current and uncontradicted for many ages, till our more enlightened moderns found reasons to condemn it; but whether right or wrong, it plainly appears that Christianity flourished here in a most eminent manner, till its purity was sullied about the beginning of the sixth century by the heresy of the Jacobites, whose patriarch still resides here, with a jurisdiction over all that sect in the Turkish dominions.

Diarbeck Proper, is a beglerbegate, under which are reckoned twelve sangiacs; and the principal towns in it are, Diarbekir or Caramed, Rika, Moussul, Orfa or Edessa, Elbir, Nisibis, Gezir Merdin, Zibin, Ur of the Chaldees, Amad, and Carasara; but all now of little note excepting Diarbekir and Moussul.

DIARBEKIR, the capital of the above district, is situated in a delightful plain, on the banks and near the head of the Tigris, about 155 miles or 15 caravan days journey, north-east from Aleppo, in latitude 37° 35', east longitude 40° 50'. The bridge of 10 arches over the said river is said to have been built by the order of Alexander the Great. It is one of the richest and most mercantile cities in all Asiatic Turkey; and is well fortified, being encompassed with a double wall, the outermost of which is flanked, with 72 towers, said to have been raised in memory of our Saviour's

72 disciples. It has several stately piazzas or market-places, well stored with all kinds of rich merchandize, and 12 magnificent mosques, said to have been formerly Christian churches. Its chief manufacture is the dressing, tanning, and dying of goat-skins, commonly called *Turkey leather*, of which the vent is almost incredible in many parts of Europe and Asia: besides this, there is another of dyed fine linen and cotton cloths, which are nearly in the same request. The waters of the Tigris are reckoned extraordinary for those two branches of trade, and give red leather a finer grain and colour than any other. There is a good number of large and convenient inns on both sides of the river, for the caravans that go to and from Persia; and on the road near the town is a chapel with a cupola, where Job is said to lie buried. This place is much frequented by pilgrims of all nations and religions, and a Turkish hermit has a cell close to it. The fair sex, who, in most other parts of the Turkish empire, are kept quite immured, and considered as mere slaves, enjoy here an extraordinary liberty, and are commonly seen on the public walks of the city in company with the Christian women, and live in great friendship and familiarity with them. The same is said of the men, who are polite, affable, and courteous, and very different from what they affect to be, especially the Turks, in other cities of this empire. The city is under the government of a basha, who has great power and very large dominions. He has commonly a body of 20,000 horse under him, for repelling the frequent incursions of the Curdes and Tartars, who always go on horseback to rob the caravans. The adjacent territory is very rich and beautiful; the bread, wine, and flesh excellent; the fruits exquisite, and the pigeons better and larger than any in Europe.

Mr Ives, who passed through this city in 1758, informs us, that "about two years ago it was very populous, its inhabitants amounting to 400,000 souls; but in the last year 300,000 died either by cold or famine. The Christians residing in the city before this calamity were reckoned to amount to 26,000, of whom 20,000 died. This account we had from one of the French missionaries, a capuchin, who also said, that before the famine the city contained 60,000 fighting men, but that now they are not able to muster 10,000. He assures us, that the houses and streets, nay the very mosques, were filled with dead; that every part of the city exhibited a dreadful image of death; and that the surviving inhabitants not only greedily devoured all kinds of beasts, brutes, and reptiles, but also were obliged to feed on human bodies. Yet, in the midst of this scene of horror, the grandees of the city had every thing in plenty; for they had taken care to monopolize vast quantities of corn, which they sold out to the other inhabitants at most extravagant prices, and thereby acquired for themselves immense fortunes. Corn rose from two piastres a measure to 50, 60, and even 70, in the space of six months. The father added, that the very severe winter of 1756, and the locusts in 1757, were the causes of this dreadful visitation: for by reason of the former, there were but few acres of land sown with corn; and by the latter, the small crop they had was in a great measure destroyed. He spoke of the severity of that winter in terms almost incredible: that it was common to see the

Diarbekir.

Diarrhoea
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Diatonick.

people fall down dead in the streets; that he himself once on quitting a warm room, and going into the open air, fell down motionless; and that his brother, in attempting to assist him, met with the same fate." This account of the effects of cold in the city of Diarbekir, which lies only in about 38° north, seems at first very surprising; but considering that the place stands on a rising ground in the midst of an extensive plain, and that the high Courdistan mountains lie to the south and east of it, and the Armenian or Turcomanian to the north, whose heads are always covered with snow, and even now in July supply the city with ice; it will not appear at all improbable, that in a very severe winter, such as was that in 1756, the inhabitants of this city should so severely feel the effects of it. Besides, fuel must have been extremely scarce, especially among the poorer sort, as nothing of this kind is produced but upon the mountains, and these lie at such a distance that the price of it must thereby be greatly enhanced.

DIARRHŒA, or LOOSENESS, in medicine, is a frequent and copious evacuation of liquid excrement by stool. See (the *Index* subjoined to) MEDICINE.

DIARTHROSIS, in anatomy, a kind of articulation or juncture of the bones; which being pretty lax, affords room for a manifest motion. The word comes from *δια*, and *αρθρον*, *juncture*, *assemblage*. It is opposed to *synarthrosis*, wherein the articulation is so close that there is no sensible motion at all. See ANATOMY, n° 2.

DIARY, a term sometimes used for a journal or day-book, containing an account of every day's proceedings. Thus we say, *diaries of the weather*, &c.

DIARY Fever, is a fever of one day. See EPHEMERA.

DIASCHISM, among musicians, denotes the difference between the comma and enharmonic diesis, commonly called the *lesser comma*.

DIASCORDIUM, in pharmacy, a celebrated composition, so called from *scordium*, one of its ingredients. See PHARMACY.

DIASTOLE, among physicians, signifies the dilatation of the heart, auricles, and arteries; and stands opposed to the SYSTOLE, or contraction of the same parts. See ANATOMY, n° 124.

DIASTOLE, in grammar, a figure in prosody whereby a syllable naturally short is made long. Such is the first syllable of *Priamides* in the following verse of Virgil:

Atque hic Priamides! nihil o tibi, amice, relictum.

DIASYRMUS, in rhetoric, a kind of hyperbole, being an exaggeration of some low, ridiculous thing.

DIATESSARON, among ancient musicians, a concord or harmonical interval, composed of a greater tone, a less tone, and one greater semitone: its proportion in numbers is as 4:3.

DIATONICK, in music, (compounded of two Greek words, viz. the preposition *δια*, signifying a transition from one thing to another, and the substantive *τονος*, importing a given degree of tension or musical note), is indifferently applied to a scale or gammut, to intervals of a certain kind, or to a species of music, whether in melody or harmony, composed of these intervals. Thus we say the *diatonick series*, a *diatonick interval*, *diatonick melody* or *harmony*. As the diato-

nick scale forms the system of diatonick music, and consists of diatonick intervals, it will be necessary, for understanding the former, that we should explain the latter. See INTERVAL.

DIATRAGACANTH, in pharmacy, a name applied to certain powders, of which gum tragacanth is the chief ingredient.

DIAUGOPHRAGMIA, in natural history, a genus of fossils of the order of septariæ, whose partitions or septa, consist of spar with an admixture of crystal. Of this genus there are three species. 1. A red kind, with brownish yellow partitions. 2. A brownish yellow kind, with whitish partitions. 3. A bluish-white kind, with straw-coloured partitions.

DIBBLE, or DIBBER, a simple but useful implement in gardening, used for planting out all sorts of young plants, &c.

DIBBLING WHEAT. See AGRICULTURE, n° 126—129.

DIBIO, or DIVIO (anc. geog.), the *Divionense Castrum*, and the *Divionum* of the lower age; a town of the Lingones, in Gallia Belgica: *Dibionenses*, the people. Now *Dijon*, the capital of Burgundy. E. Long. 5. 5. N. Lat. 47. 15.

DICE, among gamblers, certain cubical pieces of bone or ivory, marked with dots on each of their faces, from one to six, according to the number of faces.

Sharps have several ways of falsifying dice. 1. By sticking a hog's bristle in them, so as to make them run high or low as they please. 2. By drilling and loading them with quicksilver: which cheat is found out by holding them gently by two diagonal corners: for if false, the heavy sides will turn always down. 3. By filing and rounding them. But all these ways fall far short of the art of the dice-makers; some of whom are so dexterous this way, that your sharpening gamblers will give any money for them.

Dice formerly paid 5s. every pair imported, with an additional duty of 4s. 9 $\frac{1}{2}$ d. for every 20s. value upon oath; but are now prohibited to be imported.

DICÆARCHUS, a scholar of Aristotle, composed a great number of books which were much esteemed. Cicero and his friend Pomponius Atticus valued him highly. He wrote a book to prove, that men suffer more mischief from one another than from all evils beside. And the work he composed concerning the republic of Lacedæmon was extremely honoured, and read every year before the youth in the assembly of the ephori. Geography was one of his principal studies, on which science there is a fragment of a treatise of his still extant, and preserved among the *Veteris geographiæ scriptores minores*.

DICHOTOMOUS, in botany. See BOTANY, p. 442, n° 41.

DICHOTOMY, a term used by astronomers for that phasis or appearance of the moon, wherein she is bisected, or shows just half her disk. In this situation the moon is said to be in a quadrate aspect, or to be in her quadrature.

DICKER, in old writers, denotes the quantity of ten hides of skins, whereof 20 made a last: also 10 pair of gloves, ten bars of iron, and the like, are sometimes expressed by the term *dicker*.

DICKINSON (Edmund), a celebrated English physician and chemist, born in 1624. He studied and took

Diatraga-
canth
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Dickinson.

Dictamnus, took his degrees at Merton-college, Oxford; and in 1655 published there his *Delphi Phœnicizantes*, &c. a most learned piece, in which he attempted to prove, that the Greeks borrowed the story of the Pythian Apollo, and all that rendered the oracle at Delphos famous, from the Holy Scriptures, and the book of Joshua in particular: a work that procured him great reputation both at home and abroad. He practised physic first at Oxford; but removing to London in 1684, his good fortune in recovering the earl of Arlington from a dangerous sickness, procured his promotion to be physician in ordinary to Charles II. and to his household. As that prince understood and loved chemistry, Dr Dickinson grew into great favour at court; and was continued in his appointments under James II. After the abdication of his unfortunate master, being then in years, and afflicted with the stone, he retired from practice, and died in 1707. He published many other things, particularly *Physica vetus & vera*, &c. containing a system of philosophy chiefly framed on principles collected from the Mosaic history.

DICTAMNUS, WHITE DITTANY, or *Fraxinella*: A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 26th order, *Multiflora*. The calyx is pentaphyllous; the petals are five, and patulous; the filaments sprinkled with glandulous points; the capsules five, coalited. There is only one species. It hath thick, penetrating, perennial roots, collected into a head at top, sending up erect stalks annually, two or three feet high, garnished with pinnated alternate leaves, of three or four pair of oblong stiff lobes, terminated by an odd one; and the stalks crowned by long, pyramidal, loose spikes of flowers, of white, red, and purple colours. They are very ornamental plants, and succeed in any of the common borders. The dittany which grows in Crete, Dalmatia, and the Morea, forms an article in the materia medica. The leaves, which are the only parts used, are imported from Italy. The best sort are well covered over with a thick white down, and now and then intermixed with purplish flowers. In smell and taste they somewhat resemble lemon-thyme, but have more of an aromatic flavour, as well as a greater degree of pungency; when fresh, they yield a considerable quantity of an excellent essential oil.

DICTATOR, a magistrate at Rome invested with regal authority. This officer was first chosen during the Roman wars against the Latins. The consuls being unable to raise forces for the defence of the state, because the plebeians refused to enlist if they were not discharged of all the debts they had contracted with the patricians, the senate found it necessary to elect a new magistrate with absolute and uncontrollable power to take care of the state. The dictator remained in office for six months, after which he was again elected if the affairs of the state seemed to be desperate; but if tranquillity was re-established, he generally laid down his power before the time was expired. He knew no superior in the republic, and even the laws were subjected to him. He was called dictator, because *dictus*, named by the consul, or *quoniam dictis ejus parebat populus*, because the people implicitly obeyed his command. He was named by the consul in the night

viva voce, and his election was confirmed by the auguries. As his power was absolute, he could proclaim war, levy forces, conduct them against an enemy, and disband them at his pleasure. He punished as he pleased, and from his decision there lay no appeal, at least till later times. He was preceded by 24 lictors with the *fascies*; during his administration, all other officers, except the tribunes of the people, were suspended, and he was the master of the republic. But amidst all this independence, he was not permitted to go beyond the borders of Italy, and he was always obliged to march on foot in his expeditions, and he never could ride in difficult and laborious marches without previously obtaining a formal leave from the people. He was chosen only when the state was in imminent dangers from foreign enemies or inward seditions. In the time of a pestilence a dictator was sometimes elected, as also to hold the *comitia*, or to celebrate the public festivals, or drive a nail in the capitol, by which superstitious ceremony the Romans believed that a plague could be averted, or the progress of an enemy stopped. This office, so respectable and illustrious in the first ages of the republic, became odious by the perpetual usurpations of Sylla and J. Cæsar; and after the death of the latter, the Roman senate passed a decree which for ever after forbade a dictator to exist in Rome. The dictator, as soon as elected, chose a subordinate officer called his master of horse, *magister equitum*. This officer was respectable; but he was totally subservient to the will of the dictator, and could do nothing without his express order. This subordination, however, was some time after removed; and during the second Punic war the master of the horse was invested with a power equal to that of the dictator. A second dictator was also chosen for the election of magistrates at Rome after the battle of Cannæ. The dictatorship was originally confined to the patricians; but the plebeians were afterwards admitted to share it. Titus Lartius Flavus was the first dictator, in the year of Rome 253.

DICTION, the phrase, elocution, or style, of a writer or speaker. See ORATORY, n° 99—121.

DICTIONARY, in its original acceptation, is the arranging all the words of a language according to the order of the alphabet, and annexing a definition or explanation to each word. When arts and sciences began to be improved and extended, the multiplicity of technical terms rendered it necessary to compile dictionaries, either of science in general, or of particular sciences, according to the views of the compiler.

DICTIONARY of the English Language. The design of every dictionary of language is to explain, in the most accurate manner, the meaning of every word; and to show the various ways in which it can be combined with others, in as far as this tends to alter its meaning. The dictionary which does this in the most accurate manner, is the most complete. Therefore the principal study of a lexicographer ought to be, to discover a method which will be best adapted for that purpose. Dr Johnson, with great labour, has collected the various meanings of every word, and quoted the authorities: but, would it not have been an improvement if he had given an accurate definition of the precise meaning of every word; pointed out the way in which it ought to be employed with the

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Dictionary. greatest propriety; showed the various deviations from that original meaning, which custom had so far established as to render allowable; and fixed the precise limits beyond which it could not be employed without becoming a vicious expression? With this view, it would have been necessary to exhibit the nice distinctions that take place between words which are nearly synonymous. Without this, many words can only be defined in such a manner, as that they must be considered as exactly synonymous. We omit giving any quotations from Johnson, to point out these defects; and shall content ourselves with giving a few examples, to show how, according to our idea, a dictionary of the English language ought to be compiled.

IMMEDIATELY. *adv. of time.*

1. Instantly, without delay. Always employed to denote future time, and never past. Thus, we may say, *I will come immediately*; but not, *I am immediately come from such a place*. See **PRESENTLY**.
2. Without the intervention of any cause or event; as opposed to *mediately*.

PRESENTLY. *adv. of time.*

1. Instantly, without delay. Exactly synonymous with *immediately*; being never with propriety employed to denote any thing but future time.
2. Formerly it was employed to express present time. Thus, *The house presently possessed by such a one*, was often used: but this is now become a vicious expression; and we ought to say, *The house possessed at present*. It differs from *immediately* in this, that even in the most corrupt phrases it never can denote past time.

FORM. *subst.* The external appearance of any object, when considered only with respect to shape or figure. This term therefore, in the literal sense, can only be applied to the objects of the sight and touch; and is nearly synonymous with *figure*: but they differ in some respects. *Form* may be employed to denote more rude and unfinished shapes; *figure*, those which are more perfect and regular. *Form* can never be employed without denoting matter; whereas *figure* may be employed in the abstract: thus, we say a square or a triangular *figure*; but not a square or triangular *form*. And in the same manner we say, the *figure* of a house; but we must denote the substance which forms that figure, if we use the word *form*; as, *a cloud of the form of a house*, &c. See **FIGURE**.

2. In contrast to irregularity or confusion. As beauty cannot exist without order, it is by a figure of speech employed to denote beauty, order, &c.
3. As *form* respects only the external appearance of bodies, without regard to their internal qualities, it is, by a figure of speech, employed in contrast to these qualities, to denote empty show, without essential qualities. In this sense it is often taken when applied to religious ceremonies, &c.
4. As *form* is employed to denote the external appearance of bodies; so, in a figurative sense, it is applied to reasoning, denoting the particular mode

or manner in which this is conducted; as, *the Dictionary form of a syllogism*, &c.

5. In the same manner it is employed to denote the particular mode of procedure established in courts of law; as, *the forms of law, religion*, &c.
6. *Form* is sometimes, although improperly, used to denote the different circumstances of the same body; as, *water in a fluid or a solid form*. But as this phrase regards the internal qualities rather than the external figure, it is improper; and ought to be, *water in a fluid or a solid state*.
7. But when bodies of different kinds are compared with one another, this term may be employed to denote other circumstances than shape or figure: for we may say, *a juice exuding from a tree in the form of wax or resin*; although, in this case, the consistence, colour, &c. and not the external arrangement of parts, constitutes the resemblance.
8. From the regular appearance of a number of persons arranged in one long seat, such persons so arranged are sometimes called a *form*; as, *a form of students*, &c. And,
9. By an easy transition, the seat itself has also acquired that name.

GREAT. *adj.* A relative word, denoting largeness of quantity, number, &c. serving to augment the value of those terms with which it is combined, and opposed to *small* or *little*. The principal circumstances in which this word can be employed are the following:

1. When merely *inanimate* objects are considered with regard to quantity, *great* is with propriety employed, to denote that the quantity is considerable; as, *a great mountain, a great house*, &c. and it is here contrasted with *small*. When *great* is thus employed, we have no other word that is exactly synonymous.
2. When *inanimate* objects are considered with regard to their extent, this term is sometimes employed, although with less propriety; as, *a great plain, a great field*, &c. And in this sense it is nearly synonymous with *large*; and they are often used indiscriminately, but with some difference of meaning: for, as *large* is a term chiefly employed to denote extent of superficies, and as *great* more particularly regards the quantity of matter; therefore, when *large* is applied to any object which is not merely superficial, it denotes that it is the extent of surface that is there meant to be considered, without regard to the other dimensions: whereas when the term *great* is employed, it has a reference to the whole contents. If, therefore, we say, *a large house*, or *a large river*, we express that the house, the river, have a surface of great extent, without having any necessary connection with the size in other respects. But if we say, *a great house*, or *a great river*, it at once denotes that they have not only a large surface, but are also of great size in every respect.
3. *Great*, when applied to the human species, never denotes the size or largeness of body, but is applied solely to the qualities of the mind. Thus, when

when we say, that *Socrates was a great man*, we do not mean that he was a man of great size, but that he was a man who excelled in the endowments of the mind. The terms which denote largeness of size in the human body are, *big, bulky, huge, &c.*

4. *Great* is sometimes applied to the human species, as denoting high rank. In this case it is oftener used in the plural number than otherwise. Thus we say simply, *the great*, meaning the whole body of men in high station, as opposed to *mean*. It should seldom be employed in this sense, as it tends to confound dignity of rank with elevation of mind.

5. As this is a general term of augmentation, it may be joined with all nouns which denote *quantity, quality, number, excellence, or defects*; or such as imply *praise, blame, anger, contempt*, or any other affection of the mind.

6. It is employed to denote every step of ascending or descending consanguinity; as, *great-grandfather, great-grandson, &c.*

HIGH. *adj.* Exalted in a perpendicular direction at a distance from the surface of the earth. Opposed to *low*.

1. *High* is a term altogether indefinite, and is employed to express the degree of elevation of any inanimate body. Thus we say, *a high mountain, a high house, steeple, tower, pillar, &c.* Nor is there any other word that can here be considered as synonymous; *lofty* being employed only to denote a very eminent degree of elevation.

2. To express the perpendicular elevation of vegetables, either *high* or *tall* may be employed, as being in this case nearly synonymous. We may therefore say, *a high or tall tree, a high or tall mast, &c.* but with this difference between these two expressions, that *tall* can be more properly applied to those that are much elevated and of small dimensions; and *high*, to such as are more bulky, and of greater size.

3. The perpendicular height of man can never be expressed by the word *high*; *tall* being here the proper expression. And altho' *high* is sometimes used to express the height of other animals, yet it seems to be an improper expression. See **TALL**.

4. *High*, when applied to the human species, always refers to the mind; and denotes *haughtiness, stateliness, pride, &c.* and, when combined with the expressions of any energy of the mind, it denotes that in a higher degree. In this sense, it is opposed to *meanness, abjectness, and humility*.

5. As this is an indefinite term, tending to denote any thing that is elevated above us, it may be combined with almost every noun which admits of this elevation. And as objects high above us are always out of our reach, it is in a metaphorical sense used to denote any thing that seems to be above the ordinary condition of mankind; or those qualities or endowments of mind that are not easily acquired: as, *dignity or elevation of sentiment; dignity of rank; acuteness in reasoning on difficult subjects; pride, haughtiness, or any other quality which seems beyond the ordinary level of mankind; dearness of price, &c.*

6. In the same manner we apply this term to time; which having a metaphorical resemblance to a river flowing on with an unceasing current through all successive ages, any thing of remote antiquity is denoted by the term *high*.

7. Likewise those degrees of latitudes far removed from the line, where the pole becomes more elevated.

8. And to some particular crimes, as being attended with peculiar degrees of guilt; as, *high treason*.

TALL. *adj.* Something elevated to a considerable degree in a perpendicular direction. Opposed to *low*.

1. This term is chiefly employed to express the height of man and other animals; and is applied to denote the height of the body only, without having any reference to the mind. When applied to man, no other word can be substituted in its stead: when applied to other animals, *high* is sometimes considered as nearly synonymous. See **HIGH**.

2. It is likewise employed to denote the perpendicular height of vegetables; and in this case, it is nearly synonymous with *high*. See **HIGH**.

3. It can in no case be employed to express the height of merely inanimate objects; as we can never say *a tall steeple, tower, or pillar*, but *a high steeple, &c.* For the distinctions in these cases, see **HIGH**.

LONG. *adj.* A relative term, denoting the distance between the extremes of any body, which is extended more in one of its geometrical dimensions than another. Opposed to *short*.

1. This term may be applied to all inanimate objects, of whatever kind, whose dimensions in one way exceeds the other, and when not in an erect posture, whatever be the other circumstances attending them; whether it relates to superficies alone, or to solid bodies; whether these be bounded or open, straight or crooked, flexible or rigid, or in any other circumstances whatever: thus we say, *a long or short line, a long or short ridge, street, ditch, rope, chain, staff, &c.* But it is to be observed, that although *long* is in the strict sense only opposed to *short*; yet as it expresses the extension of matter in one of its geometrical proportions, it is often contrasted by those words which express the other proportions when we mean only to describe the several proportions: as, *a table long and broad*. And as these several dimensions are expressed by different words, according to the various forms, modifications, and circumstances, in which bodies are found, therefore it is in this sense contrasted by a great diversity of terms: as, *a long and broad or wide, narrow or strait, street or lane; a long and thick, or small, rope, chain, staff*. For the distinctions in these cases, see **BROAD, WIDE, &c.**

2. Objects necessarily fixed in an erect position can never have this term applied to them; and therefore we cannot say *a long*, but *a high, tower or steeple*. And for the same reason, while trees are growing and fixed in an erect position, we cannot apply this term to them; but when they are fell-

ed and laid upon the ground, it is quite proper and necessary. Thus, we do not say *a long*, but *a tall* or *high tree*, while it is growing; but we say *a long*, not *a tall log of wood*: and in the same manner we say *a tall mast*, when it is fixed in the ship; but *a long mast*, while it lies upon the beach. See TALL and HIGH.

3. Those vegetables which are of a tender pliant nature, or so weak as not to be able to retain a fixt position, being considered as of a middle nature between erect and prostrate bodies, admit of either of the terms *long*, *tall*, or *high*; as, *a long* or *tall rush* or *willow wand*, or *a long*, *tall*, or *high stalk of corn*. See HIGH and TALL.
4. The parts of vegetables, when considered as distinct from the whole, even when growing and erect, assume the term *long*: for we do not say *a tall*, but *a long shoot of a tree*; and *a tree with a long stem*, in preference to *a tree with a high stem*.
5. For the same reason, a staff, and pole, even when fixed in a perpendicular direction, assume the word *long*, in preference to *tall* or *high*.
6. With regard to animals, the general rule is applied, without any exceptions: *tall*, and not *long*, being employed to denote the height of the human body, when in an erect posture; and *long*, and not *tall*, to denote its length when in an incumbent situation. *Long*, applied to all other animals which do not walk erect, always denotes their greatest length in a horizontal position from head to tail.
7. In a figurative sense, it denotes, with regard to time, any thing at a great distance from us.
8. As also, any thing that takes up much time before it is finished; as, *a long discourse*, *a protracted note in music*, &c.

BROAD, *adj.* The distance between the two nearest sides of any body, whose geometrical dimensions are larger in one direction than in another; and has a reference to superficies only, and never to the solid contents. Opposed to *narrow*.

1. *Broad*, in the strictest acceptation, is applied to denote those bodies only whose sides are altogether open and unconfined; as, *a broad table*, *a broad wheel*, &c.: and in these cases it is invariably contrasted by the word *narrow*; nor is there any other word which in these cases can be considered as synonymous with it, or used in its stead.
2. When any object is in some sort bounded on the sides, although not quite closed up, as a road, street, ditch, &c. either *broad* or *wide* may be employed, but with some difference of signification; *broad* being most properly used for those that are more open, and *wide* for those which are more confined: nor can this term be ever applied to such objects as are close bounded all around, as a house, a church, &c. *wide* being here employed. For the more accurate distinctions in these cases, see the article WIDE.

WIDE, *adj.* A term employed to denote relative extent in certain circumstances. Opposed to *narrow* and *strait*.

1. This term is in its proper sense applied only to denote the space contained within any body closed all round on every side; as a house, gate, &c.: and

differs from *broad* in this, that it never relates to the superficies of solid objects, but is employed to express the capaciousness of any body which containeth vacant space; nor can capaciousness in this sense be expressed by any other word but *wide*.

2. As many bodies may be considered either with respect to their capaciousness or superficial extent; in all these cases, either the term *broad* or *wide* may be used; as, *a broad* or *wide street* or *ditch*, &c. but with a greater or less degree of propriety, according to the circumstances of the object, or the idea we wish to convey. In a street where the houses are low and the boundaries open, or in a ditch of small depth and large superficies, as this largeness of superficies bears the principal proportion, *broad* would be more proper: but if the houses are of great height, or the ditch of great depth, and capaciousness is the principal property that affects the mind, we would naturally say *a wide street* or *ditch*; and the same may be said of all similar cases. But there are some cases in which both these terms are applied, with a greater difference of meaning; thus we say *a broad* or *a wide gate*: But as the gate is employed to denote either the aperture in the wall, or the matter which closes that aperture, these terms are each of them used to denote that particular quality to which they are generally applied: and as the opening itself can never be considered as a superficies, the term *wide*, in this case, denotes the distance between the sides of the aperture; while, on the contrary, *broad* denotes the extent of matter fitted to close that aperture; nor can these two terms in any case be substituted for one another.

3. As a figurative expression, it is used as a cant phrase for a mistake: as, *you are wide of the mark*; that is, not near the truth.

NARROW, *adj.* A relative term, denoting a proportional smallness of distance between the sides of the superficies of plain bodies. Opposed to *broad*.

1. As this is only applied to superficies, it is exactly contrasted by *broad*, and is applied in all cases where the term *broad* can be used, (see BROAD); and in no other case but as a contrast to it, except the following.
2. It sometimes is employed to describe the smallness of space circumscribed between certain boundaries, as opposed to *wide*, and nearly synonymous with *strait*; as we say *a wide* or *a narrow house*, *church*, &c. For the necessary distinctions here, see the article STRAIT.
3. In a figurative sense it denotes *parsimony*, *poverty*, *confined sentiments*, &c.

STRAIT, *adj.* A relative term, denoting the extent of space in certain circumstances. Opposed to *wide*; see WIDE.

1. This term is employed, in its proper sense, to denote only space, as contained between surrounding bodies in such circumstances as to denote some degree of confinement; and is exactly opposed to *wide*: as, *a wide* or *a strait gate*, &c. See WIDE.
2. So necessary is it that the idea of confinement should

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should be connected with this word, that in all those cases where the space contained is large, as in a church or house, we cannot express a smaller proportional width by this term. And as we have no other word to express space in these circumstances, we have been obliged to force the word *narrow* from its natural signification, and make it express this. See *NARROW*.

3. In some particular cases, *narrow* or *strait* may be employed to the same object; as, a *narrow* or a *strait line*: but here *strait* is never employed but where an idea of confinement is suggested, and where it is exactly contrasted to *wide*; nor can *narrow* be employed but in such circumstances where *broad* would be a perfect contrast to it. Therefore these two terms may be always employed in the same circumstances as those which contrast them may be. For an account of which, see *WIDE*.

3. The term *strait* is likewise in a peculiar manner used to denote the smallness of the internal diameter of those small bodies which are fitted to receive or contain others, as any kind of bag, tube, body-clothes, mortoise, and others of the same kind; and in all these cases this term may be employed to denote the smallness of their lesser diameter, and never the term *narrow*. But in certain circumstances the word *tight* may be substituted for it. See *TIGHT*.

4. *Strait*, in a figurative sense, denotes any sort of confinement of sentiment or disposition.

TIGHT. *adj.* A term employed in certain circumstances to denote the internal capacity of particular bodies. Nearly synonymous with *strait*.

This term is confined entirely to denote the smallness of the internal dimensions of such objects as are formed to cover or to receive or contain other solid bodies, and can be employed in no other case. And although it agrees with *strait*, in always denoting confinement, and by being applicable to the same species of objects, yet it differs in the following respects: 1. If there be any difference of the diameter of the objects to which the term *strait* can be applied, it always has reference to the smaller; yet *tight* may be applied to any sort of confinement, whether it regards the length or breadth. 2. *Strait* can be applied to all bodies of capacity when of small diameter, without any sort of reference to the nature of the substance which it may be capable of containing. For we can say a *strait bag*, a *strait sleeve*, a *strait mortoise*, a *strait gate*, &c. whereas *tight* can only be applied to any body when it is considered as having reference to another body which is intended to be contained in it, and is pinched for want of room. Thus we say, *the sleeve of a coat is too tight for the arm*, *the mortoise is too tight for the tenon*, &c.; but we cannot say, *the bag*, or *the gate*, *is too tight*, because these are fitted to receive any sort of objects. And hence it happens, that, in many cases, the dimensions of the same body may be expressed by *tight* or *strait* when considered in different circumstances. Thus we may say, *this sleeve is too strait*, when we look at

a coat when lying on the table, and consider its proportions; but it is not till we have tried it upon the arm that it is intended to cover, that we call it *tight*. And we may say, *a gate is too strait*, or *too tight*: but in the first case we consider it as being too confined for admitting objects to pass through it; and in the last, as being too confined with respect to the leaves that are to shut the aperture, not allowing them space to move with freedom.

These examples may serve to give some idea of the plan of an English Dictionary composed upon philosophical principles: But, besides the circumstances above enumerated, there are many others which would require particular attention in the execution of a work of this kind. In the English language, a great variety of terms occur, which denote matter under certain general forms or circumstances, without regarding the minute diversities that may take place; as the word *cloth*, which denotes matter as manufactured into a particular form, including under it all the variety of stuffs manufactured in that particular way, of whatever materials, colours, texture, or fineness, they may be. The same may be said of *wood*, *iron*, *yarn*, and a great variety of terms of the same nature, some of which cannot assume any plural; while others admit of it in all cases, and others admit or refuse it according to the different circumstances in which they are considered. In a dictionary, therefore, all this variety of cases ought to be clearly and distinctly pointed out under each particular article: this is the more necessary, as some of these words have others formed from them, which might be readily mistaken for their plurals, altho' they have a very different signification; as *cloaths*, which does not denote any number of pieces or different kinds of *cloth*, but *wearing apparel*. The following example will illustrate this head.

WOOD. *sub.* A solid substance, of which the trunks and branches of trees consist.

1. This term is employed to denote the solid parts of vegetables of all kinds, in whatever form or circumstances they are found. Nor does this term admit of plural with propriety, unless in the circumstances after-mentioned: for we say, *many different kinds of wood*, in preference to *many kinds of woods*; or, we say, *oak*, *ash*, or *elm wood*, not *woods*.
2. But where we want to contrast *wood* of one quality or country with that of another, it admits of a plural: for we say, *white woods are in general softer than red*; or *West-Indian woods are in general of greater specific gravity than the European woods*: But unless where the colour, or some quality which distinguishes it from growing wood, is mentioned, this plural ought as much as possible to be avoided, as it always suggests an idea of growing wood.
3. *Wood* likewise denotes a number of trees growing near one another; being nearly synonymous with *forest*: See *FOREST*. In this sense it always admits of a plural; as, *The woods and wilds whose solitary gloom*, &c.

A dictionary cannot be reckoned complete without explaining obsolete words; and if the terms of the several

Dictionary. veral provincial dialects were likewise given, it would be of great utility: nor would this take much time; because a number of these words needs no other explanation than to mark along with them the words which had come in their place, when there happened to be one perfectly synonymous: and in those cases where the same idea could not be expressed in modern language without a periphrasis, it would be of use to explain them distinctly; so that, when a writer found himself at a loss for a term, and obliged to search for one beyond the bounds of our own language, he might take one of these, when he found that it was expressive and energetic, in preference to another drawn from a foreign language. This would at least have one good effect: it would make our language more fixed and stable; not to say more accurate and precise, than by borrowing from foreign languages. The following examples may serve to give some idea of the manner of treating this part of the work.

MOE, or *mo*. *adj.* An obsolete term still employed in the Scotch dialect, and by them pronounced *mae*; denoting a greater number, and nearly synonymous with *more*: but it differs in this respect, that in the Scotch dialect, *mae* and *mair* (English *more*) are each employed in their distinct sphere, without encroaching upon one another; *mae* being employed to denote number, but never quantity or quality; and *mair*, to denote quantity and quality, but never number: thus they say *mae*, not *mair*, *apples*, *men*, &c. and they say *mair*, not *mae*, *cloth*, *earth*, *courage*, &c. See *MAIR*. Both of these terms are supplied by the word *more*; which in the English language is applied indiscriminately to denote quantity, quality, and number. See *MORE*.

THIR. *pron.* Obsolete; still employed in the Scotch dialect: the plural of *this*; and contrasted to *these*, in the same manner as *that* is to *this*.

As there is no word in the English language equivalent to this, we thus show the manner in which it is employed. In the English language we say, *that stone* or *house*, pointing at one at a distance, *is larger or more commodious than this stone* or *this house*, which is supposed to be at hand. In the same manner, in the Scotch dialect, they say, *these* (or, as it is pronounced, *thae*) *stones* are whiter than *thir stones*; denoting, that the former are at a distance, and the latter at hand. And, in the same manner, it is invariably applied to denote any present object in the plural number, as opposed to *these*: as *these* or *thir apples*, as at hand, or at a distance; *these*, or *thir trees*, &c; but never in the singular number, as it is always *this* or *that tree*, *house*, &c.

As the English language is so exceedingly irregular in the pronunciation, the same letter in the same situation often assuming sounds totally different in different words, it is impossible to establish any general rules on this subject, which do not admit of many exceptions: therefore, a dictionary is the best means of ascertaining and pointing out the proper pronunciation of words. For, if the writer first pointed out all the different sounds that the same letter could ever be made to express, and assigned to every particular sound which

each letter could be made to assume, a particular mark, which was appropriated to denote that particular sound of the letter whenever it occurred; by placing these particular marks above the letters in the dictionary, the sound of each letter would be pointed out in all cases with the utmost certainty. It would be impossible for us to illustrate this by examples, without first ascertaining all the sounds of each letter; which would lead us into a discussion too long for this place.

We shall only further observe, that, besides having the accented syllable of every word properly distinguished in a dictionary to assist in the pronunciation, the English language requires another essential improvement, *viz.* the use of accents to distinguish the meaning of words and phrases: which, although it is not so properly confined to a lexicographer, yet it is not quite without his sphere. Thus the word *as* admits of two very different sounds, as well as different significations; as in this example, "Cicero was nearly *as* eloquent *as* Demosthenes:" in which the first *as* is pronounced *ast*, and the last is pronounced *az*. Now, it often happens, that, in reading, the particular way in which it ought to be understood is not pointed out by the context, till after the word itself is pronounced, which has an equal chance at least of being pronounced wrong; whereas, if it were always accented when employed in the one sense, and not in the other, it would free the reader from this perplexity. There are other cases in which the use of proper accents in writing would be of great consequence; as at the beginning of a sentence, when it was put as a question, or used ironically, &c. the want of which every one must have observed. But as this does not so properly belong to the lexicographer as the grammarian, we shall here take no further notice of it.

The above examples, we hope, will be sufficient to give the reader some idea of the plan that we would propose; and enable him to determine, whether or not a dictionary, executed upon this plan, would convey to his mind a more perfect knowledge of the English language, than those dictionaries that have been hitherto published. These examples were given rather with a view to show the manner in which a work of this kind might be conducted, than as perfect and unexceptionable explanations of the several articles there enumerated; and therefore we did not think it necessary to produce any authorities, although we are sensible that they would be requisite in such a work.

DICTYMNIA, or *DICTYNNIA*, in mythology, were feasts celebrated at Lacedæmon and in Crete, in honour of Diana Dictymnia or Dictynnia, or of a nymph taken for her, who, having plunged herself into the sea, to escape the passion of Minos, was caught in a fisherman's net or δίχτυον, whence the name.

DICTYS (Cretensis), a very ancient historian, who serving under Idomeneus king of Crete in the Trojan war, wrote the history of that expedition in nine books; and Tzetzes tells us, that Homer formed his Iliad upon the plan of that history. It is however maintained, that the Latin history of Dictys which we have at present is spurious.

DIDACTIC, in the schools, signifies the manner of speaking or writing, adapted to teach or explain the

the

Didapper, the nature of things. — The word is formed from the *Didelphis*. Greek *διδασκα, doceo*, "I teach."

There are many words that are only used in the didactic and dogmatic way: and there are many works, ancient and modern, both in prose and verse, written after this method: such are the *Georgics* of Virgil, Lucretius's poem *De Rerum Natura*, and Pope's *Essays on Criticism* and on *Man*, &c. &c.

DIDAPPER, in ornithology. See **COLYMBUS**.

DIDELPHIS, or **OPOSSUM**, in zoology; a genus (in Vol. V.) of quadrupeds belonging to the order of *feræ*, the characters of which are these: They have ten fore-teeth in the upper jaw, and eight in the under one. The dog-teeth are long; the tongue is somewhat ciliated; and they have a pocket formed by a duplicature of the skin of the belly, in which the dugs are included.

1. The *marfupialis*, or *Virginian opoffum*, has a long sharp-pointed nose; large, round, naked, and very thin ears; small, black, lively, eyes; long stiff hairs on each side the nose, and behind the eyes: the hind part of the neck and back covered with hair two inches long; the bottoms of a yellowish white, middle part black, ends whitish: the sides covered with hair of a dirty and dusky colour; the belly with soft, woolly, dirty white hair: the tail, for near three inches, clothed with long hairs like those on the back; the rest of the tail covered with small scales. The tail of this animal has a disagreeable appearance, looking like the body of a snake, and has the same prehensile quality with that of some monkeys; the body is round and pretty thick, the legs short: on the lower part of the belly of the female is a large pouch, in which the teats are lodged, and where the young shelter as soon as they are born. The length of the body is 16 or 17 inches; that of the tail 14. — This creature inhabits many parts of America and the East Indies. It is very destructive to poultry, and sucks the blood without eating the flesh; it feeds also on roots and wild fruits, and is very active in climbing trees. It hunts eagerly after birds and their nests; and will hang suspended from the branches of a tree by its tail; then, by swinging its body, it will fling itself among the trees that grow in the neighbourhood. It walks very slow; and when pursued and overtaken will feign itself dead. It is not easily killed, being as tenacious of life as a cat. When the female is about to bring forth, she makes a thick nest of dry grass in some close bush at the foot of a tree; and brings four, five, or six, young at a time. As soon as the young are brought forth, they take shelter in the pouch or false belly; and fasten so closely to the teats, that they cannot be separated without difficulty. They are blind, naked, and very small, when new-born, and resemble fetuses: it is therefore necessary that they should continue in that false belly till they attain proper strength and sight; and are prepared to undergo what may be called a *second birth*. After this they run into the pouch as into an asylum in time of danger; and the parent carries them about with her. During the time of this second gestation, the female shows an excessive attachment to her young, and will suffer any torture rather than allow this receptacle to be opened; for she has the power of opening or closing it by the assistance of some very strong muscles. The flesh of the old animal is very good, like that of a sucking pig: the hair

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is dyed by the Indian women, and wove into garters and girdles: the skin is very fetid. *Didelphis.*

2. The *Molucca opoffum* has long, oval, and naked ears: the mouth is very wide: the lower side of the upper jaw, throat, and belly, is of a whitish ash colour; rest of the hair a cinereous brown tipped with tawny, darkest on the back: the tail is as long as the body; near the base covered with hair, the rest naked: the claws are hooked. On the belly of the female is a pouch, in which the young (like those of the former) shelter. *Marcgrave* found six young within the pouch. It has ten cutting teeth above and eight below. The length of the animal from nose to tail is ten inches; and the tail exceeds the length of head and body. Its whole figure is of a much more slender and elegant make than the former. The tail pulverised, and taken in a glass of water, is reckoned in New Spain a sovereign remedy against the gravel, colic, and several other disorders. This species is found in great numbers in *Aroe* and *Solor*: It is called in the Indies *pelandor aroe*, or the *aroe rabbit*. They are reckoned very delicate eating; and are very common at the tables of the great, who rear the young in the same places in which they keep their rabbits. It inhabits also *Surinam*, and the hot parts of America.

3. The *murina*, or *murine opoffum*, hath the face and upper parts of the body of a tawny colour; the belly of a yellowish white: the tail is slender, and covered with minute scales to the very runip: the length of the animal from nose to tail, about six inches and a half; the tail of the same length: the female wants the false belly of the former; but on the lower part the skin forms on each side a fold, between which the teats are lodged. It inhabits the hot parts of South America; agrees with the others in its food, manners, and the prehensile power of its tail. It brings from 10 to 14 young ones at a time: they affix themselves to the teats as soon as they are born, and remain attached like inanimate things, till they attain growth and vigour to shift a little for themselves.

4. The *Mexican opoffum*, is of an ash-colour on the head and upper parts of the body: the belly and legs are whitish: the tail is long and pretty thick, varied with brown and yellow; it is hairy near an inch from its origin, the rest naked: the length of the animal from nose to tail, about seven inches and a half; of the tail, more than 11. — It inhabits the mountains of Mexico, and lives in trees, where it brings forth its young: when in any fright, they embrace the parent closely. The tail is prehensile, and serves instead of a hand.

5. The *phalanger*, or *Surinam opoffum* of *Buffon*, has the upper part of the body reddish, mixed with a light ash-colour and yellow: the under parts are of a dirty yellowish white; the bottom of the tail is covered with hair, for near two inches and a half; the rest naked: the length of the animal from nose to tail is near nine inches; the tail ten. It inhabits *Surinam*, according to *Buffon*; who supposes it may be the species called by the colonists the *cane rat*, which is so destructive to the sugar-canes. According to *Dr Pallas*, it inhabits the East India islands, but is not found in *Surinam*.

6. The *dorsigera*, or *merian opoffum*, hath the head and upper part of the body of a yellowish brown colour; the belly white, and tinged with yellow; the

C

tail

Didelphis. tail very long and slender, and, except at the base, quite naked.—It is a native of Surinam, and burrows under ground: it brings five or six young at a time, which follow their parent: on any apprehension of danger, they all jump on her back; and twisting their tails round her's, she immediately runs with them into her hole.

7. The kangaroo. This animal has a small head, neck, and shoulders; the body increasing in thickness to the rump. The head is oblong, formed like that of a fan, and tapering from the eyes to the nose; end of the nose naked and black; the upper lip divided. The nostrils are wide and open; the lower jaw is shorter than the upper; and the aperture of the mouth small: there are whiskers on both jaws, those on the upper longest; and strong hairs above and below the eyes. The eyes are not large; the irides are dusky; the pupil is of a bluish black. The ears are erect, oblongly ovated, rounded at the ends, and thin, covered with short hairs; four inches long. There are no canine teeth; but six broad cutting teeth in the upper jaw; two long lanceolated teeth in the lower, pointing forward; and four grinding teeth in each jaw, remote from the others. The belly is convex and great. The fore legs are very short, scarcely reaching to the nose; and useless for walking. The hind legs are almost as long as the body; and the thighs are very thick: on the fore feet are five toes, with long conic and strong claws; on the hind feet, only three: the middle toe is very long and thick, like that of an ostrich; the two others are placed very distinct from it, and are small: the claws are short, thick, and blunt: the bottom of the feet, and hind part, black, naked, and tuberculated, as the animal rests often on them. The tail is very long, extending as far as the ears; thick at the base, tapering to a point. The scrotum is large and pendulous. The hair on the whole animal is soft, and of an ash-colour; lightest on the lower parts. The dimensions of a full grown animal are not yet known. The following are those of a male lately sent to Lord Sidney by Governor Phillip.

Length from the point of the nose to the end of the tail,	f.	in.
Length of the tail,	8	5
head,	3	1
fore legs,	0	11
hind legs,	2	0
Circumference of the fore part by the legs,	3	7
lower parts	1	9
Round the thicker part of the tail, which gradually tapers to the end.	4	5
	1	1

The above is the largest kangaroo that has yet been seen, and we are told there is every reason to believe that even this had not nearly attained its full growth.

It inhabits the western side of New Holland, and has as yet been discovered in no other part of the world. It lurks among the grass; and feeds on vegetables: it goes entirely on its hind legs; making use of the fore feet only for digging, or bringing its food to its mouth. The dung is like that of a deer. It is very timid: at the sight of men it flies from them by amazing leaps, springing over bushes seven or eight feet high; and going progressively from rock to rock. It

carries its tail quite at right angles with its body when it is in motion; and when it alights, often looks back.

In the account lately published of Governor Phillip's Voyage, we are told that these animals have been seen feeding in herds of about 30 or 40; and that one is always observed to be apparently on the watch at a distance from the rest.—The largest kangaroo which has yet been shot, we are there told, weighed about 140 pounds. But it has been discovered that there are two kinds, one of which seldom exceeds 60 pounds in weight: these live chiefly on the high grounds: their hair is of a reddish cast, and the head is shorter than the larger sort. Young kangaroos which have been taken, have in a few days grown very tame, but none have lived more than two or three weeks. Yet it is still possible that when their proper food shall be better known, they may be domesticated. Near some water was found the dung of an animal that fed on grass, which, it was supposed, could not have been less than a horse. A kangaroo, so much above the usual size, would have been an extraordinary phenomenon, though no larger animal has yet been seen, and the limits of growth in that species are not ascertained. The tail of the kangaroo, which is very large, is found to be used as a weapon of offence, and has given such severe blows to dogs as to oblige them to desist from pursuit. Its flesh is coarse and lean, nor would it probably be used for food, where there was not a scarcity of fresh provisions.

Mr Pennant observes, that this is a very anomalous animal; but ranks it under this genus as having more relation to it than to any other. In the account of Phillip's Voyage, however, we are informed, that the pouch of the female, hitherto esteemed peculiar to the opossum genus, has been found both in the rat and the squirrel kind in New Holland.

8. The quoll, or spotted opossum, is described as in length from the nose to the beginning of the tail about 15 inches, and the tail about nine or ten. The general colour black, inclining to brown beneath; the neck and body, spotted with irregular roundish patches of white; the ears pretty large and erect; the visage pointed, the muzzle furnished with long slender hairs; the legs, from the knees downward, almost naked, and ash-coloured; on the fore feet are five claws, and on the hind, four and a thumb without a claw; the tail, for about an inch and an half from the root, is covered with hairs of the same length as those on the body, from thence to the end with long ones not unlike that of a squirrel. The female has six teats placed in a circle within the pouch.

9. The kangaroo rat is described as similar, both in the general shape of the body and the conformation of the legs, to the kangaroo; but the visage having a strong resemblance to that of the rat, and the colour of the whole not ill resembling that animal, it has obtained the name of the *kangaroo rat*. It is an inhabitant of New Holland; and two of the species are now to be seen alive at the curious exhibition of animals over Exeter Exchange; where one of them, being a female, has brought forth young. This species has two cutting teeth in front of the upper jaw, with three others on each side of them; and at a distance

Didelphis. one false grinder, sharp at the edge, and channelled or fluted on the sides; and close to these, two true grinders: in the lower jaw there are two long cutting teeth formed like those of the squirrel, with three grinders corresponding with those in the upper jaw.

10. The flying opossum, a beautiful species, and clothed with fur of the most exquisite texture, is an inhabitant of New Wales. In length, from the tip of the nose to the root of the tail, it is 20 inches; the tail itself is 22 inches, at the base quite light, increasing gradually to black at the end: the ears are large and erect: the coat or fur is of a richer and most delicate texture; appearing, on the upper parts of the body, at first sight, of a glossy black, but on a nicer inspection found to be mixed with grey; the under parts are white, and on each hip is a tan-coloured spot nearly as big as a shilling; at this part the fur is thinnest, but at the root of the tail it is so rich and close that the hide cannot be felt through it. The fur is also continued to the claws. On each side of the body is a broad flap or membrane (as in the flying squirrels), which is united to both the fore and hind legs. The jaws are furnished with teeth, placed as in some others of this genus: in the upper jaw forwards are four small cutting teeth, then two canine ones, and backwards five grinders: the under jaw has two long large cutting teeth, five grinders, with no intermediate canine ones, the space being quite vacant. The fore legs have five toes on each foot, with a claw on each; the hinder ones four toes, with claws (the three outside ones without any separation), and a thumb without a claw, enabling the animal to use the foot as a hand, as many of the opossum tribe are observed to do.

11. The Cayenne opossum has a long slender face; ears erect, pointed, and short: the coat woolly, mixed with very coarse hairs, three inches long, of a dirty white from the roots to the middle; from thence to the ends of a deep brown; sides and belly of a pale yellow; legs of a dusky brown; thumb on each foot distinct; on the toes of the fore feet, and thumb of the hind, are nails; on the toes of the hind feet crooked claws; tail very long, taper, naked, and scaly. Length 17 French inches; of the tail fifteen and a half. The subject measured was young. Inhabits Cayenne: very active in climbing trees, on which it lives the whole day. In marshy places, feeds on crabs, which when it cannot draw out of their holes with its feet, it hooks them by means of its long tail. If the crab pinches its tail, the animal sets up a loud cry, which may be heard afar: its common voice is a grunt like a young pig. It is well furnished with teeth, and will defend itself stoutly against dogs; brings forth four or five young, which it secures in some hollow tree. The natives eat these animals, and say their flesh resembles a hare. They are easily tamed, and will then refuse no kind of food.

12. The New Holland opossum has the upper part of the head, and the back and sides, covered with long, soft, glossy hairs, of a dark cinereous colour at the bottoms, and of a rusty brown towards the ends: the belly is of a dirty white. The tail is taper, covered with short brown hairs, except for four inches and a half of the end, which is white, and naked un-

derneath; the toes like those of the former. Described by Mr Pennant from a skin, the length of which, from the head to the tail, was 13 inches, and the tail the same. The animal was found near Endeavour river, on the eastern coast of New Holland, with two young ones. It lodges in the grass, but is not common. There are two or three other species.

DIDO, called also ELISA, a daughter of Belus king of Tyre, who married Sichæus or Sicharbas her uncle, who was priest of Hercules. Pygmalion, who succeeded to the throne of Tyre after Belus, murdered Sichæus to get possession of the immense riches which he had; and Dido, disconsolate for the loss of her husband, whom she tenderly loved, and by whom she was equally esteemed, set sail in quest of a settlement with a number of Tyrians, to whom the cruelty of the tyrant became odious. According to some accounts, she threw into the sea the riches of her husband which Pygmalion so greedily desired, and by that artifice compelled the ships to fly with her that had come by order of the tyrant to obtain the riches of Sichæus. During her voyage, Dido visited the coast of Cyprus; where she carried away 50 women who prostituted themselves on the sea-shore, and gave them as wives to her Tyrian followers. A storm drove her fleet on the African coast, and she bought of the inhabitants as much land as could be covered by a bull's hide cut into thongs. Upon this piece of land she built a citadel called *Byrsa*; and the increase of population, and the rising commerce among her subjects, soon obliged her to enlarge her city and the boundaries of her dominions. Her beauty, as well as the fame of her enterprise, gained her many admirers; and her subjects wished to compel her to marry Iarbas king of Mauritania, who threatened them with a dreadful war. Dido begged three months to give her decisive answer; and during that time she erected a funeral pile, as if wishing by a solemn sacrifice to appease the manes of Sichæus, to which she had promised eternal fidelity. When all was prepared, she stabbed herself on the pile in presence of her people; and by this uncommon action obtained the name of *Dido*, "valiant woman," instead of *Elisa*. According to Virgil and Ovid, the death of Dido was caused by the sudden departure of Æneas; of whom she was deeply enamoured, and whom she could not obtain as a husband. This poetical fiction represents Æneas as living in the age of Dido, and introduces an anachronism of near 300 years. Dido left Phœnicia 247 years after the Trojan war or the age of Æneas, that is, about 953 years before Christ. This chronological error proceeds not from the ignorance of the poets, but it is supported by the authority of Horace:

Aut famam sequere, aut sibi convenientia fingere.

While Virgil describes, in a beautiful episode, the desperate love of Dido, and the submission of Æneas to the will of the gods, he at the same time gives an explanation of the hatred which existed between the republics of Rome and Carthage; and informs his reader, that their mutual enmity originated in their very first foundation, and was apparently kindled by a more remote cause than the jealousy and rivalry of two flourishing empires. Dido after her death was honoured as a deity by her subjects.

Didus.

DIDUS, or *dodo*, in ornithology, a genus belonging to the order of gallinæ. The bill is contracted in the middle by two transverse rugæ; each mandible is inflected at the point; and the face is bare behind the eyes. Only one species, the ineptus, is mentioned by Linnæus; but three are described by Buffon: though it is doubted whether on further observation they may not all prove one and the same species, differing only in sex or age.

1. The dronte, or hooded dodo, (*ineptus*, *Lin.*), is somewhat bigger than a swan, and near three feet in length. The bill is strong, large, and hooked at the end; the gape stretches beyond the eyes: the colour of it is a very pale blue; except the end of the upper mandible, which is yellowish, and a red spot on the bend of it; the end of the lower is blackish: the irides are white. The general colour of the plumage is cinereous, and soft to the touch; the belly and thighs are whitish. The head is large, and seems as it were covered with a black hood or cowl. The wings are very short, and of a yellowish ash-colour: the tail feathers are curled, stand up on the rump, and incline to yellow. The legs have four toes, three before and one behind; are very stout, short, and yellowish: the claws are black. It inhabits the islands of Mauritius and Bourbon in the Indian Ocean.

2. The solitaire, or solitary dodo, is a large bird, and the male is said to weigh sometimes 45 pounds. The neck is of a proportionable length, and the eye black and lively: the head is not crested, and the general colour of the plumage is grey and brown mixed: it has scarce any tail, and the bastard wing swells out into a round knob: the wings are too short for flight; and the hind parts are rounded like a horse's rump, being clothed with feathers, which may be termed *coverts*. — The females are covered with sometimes brown and sometimes light yellow feathers, and appear very beautiful. The feathers on each side of the breast enlarge into two white tufts, somewhat resembling the bosom of a woman. Those of the thighs are rounded at the end like shells; and, according to Leguat, the bird has altogether a noble and elegant gait. This is an inhabitant of the Isle of Rodrigue, where it is not uncommon; but not met with in flocks, scarcely more than two being found together. It makes the nest in by-places, of leaves of the palm, a foot and a half in thickness; and lays one egg, bigger than that of a goose. The male sits in his turn; and does not suffer any bird to approach within 200 yards of the spot while the hen is sitting, which is seven weeks. The young is some months before it can shift for itself; the old ones, in the mean time, are affectionate to it, and faithful to each other afterwards, though they occasionally may mix with others of their kind. The young birds, though timid, are stupid enough to suffer the approach of any one; but when grown up, are more shy, and will not be tamed. They are chased in the winter season, viz. from March to September; being then fat, and the young birds are much esteemed for the table.

3. The Nazarene dodo is bigger than a swan. The bill is a little bent downwards and large: instead of feathers, the whole is covered over with a black down; but the wings are feathered, and it has some frizzled

ones upon the rump, which serve instead of a tail: the legs are long and scaly, and there are three toes on each foot. This was met with in the Isle of France, and described as above by Fr. Cauche; who adds, that the female only lays one egg, which is white, and as big as a penny loaf, and that there is always found with it a white stone of the size of an hen's egg; that it makes the nest of leaves and dry herbs, in the forests, on the ground; and that there is likewise found a grey stone in the gizzard of the young bird.

DIDYMUS of Alexandria, an ecclesiastical writer of the fourth century; who, though he is said to have lost his eyes at five years of age, when he had scarcely learned to read, yet applied so earnestly to study, that he attained all the philosophic arts in a high degree, and was thought worthy to fill the chair in the famous divinity-school at Alexandria. He was the author of a great number of works: but all we have now remaining are, a Latin translation of his book upon the Holy Spirit, in the works of St Jerome, who was the translator; short strictures on the Canonical Epistles; and a book against the Manichees.

DIDYNAMIA (from *dis* twice, and *δυναμις* power), the name of the 14th class in Linnæus's sexual method; consisting of plants with hermaphrodite flowers, which have four stamina or male organs, two of which are long and two short. See *BOTANY*, the Scheme, and Plate CII. fig. 14.

DIEMEN'S LAND, the southern coast or point of New Holland, S. Lat. 43° 21' 20", E. Long. 147° 29'. This coast was discovered in November 1642 by Tasman, who gave it the name of *Van Diemen's Land*. Captain Furneaux touched at it in March 1773, and the country has been since further explored by our late navigators. Here is a very safe road, named by Captain Cook *Adventure Bay*. The parts adjoining to the bay are mostly hilly, and form an entire forest of tall trees, rendered almost impassable by brakes of fern, shrubs, &c. The soil on the flat land, and on the lower part of the hills, is sandy, or consists of a yellowish earth, and in some parts of a reddish clay; but further up the hills it is of a grey tough cast. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor stones of any other kind than the white sand-stone, were observed: nor any vegetables that afforded subsistence for man. The forest-trees are all of one kind, generally quite straight, and bearing clusters of small white flowers. The principal plants observed were wood-sorrel, milk-wort, cudweed, bell-flower, gladiolus, samphire, and several kinds of fern. The only quadruped seen distinctly was a species of opossum, about twice the size of a large rat. The kangaroo, found farther northward in New Holland, may also be supposed to inhabit here, as some of the inhabitants had pieces of the skin of that animal. The principal sorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yellowish paroquets, and a species which was called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the shore were several gulls, black oyster-catchers or sea-pies, and plovers of a stone-colour. In the woods were seen some blackish snakes of a pretty large size; and a species of lizard fifteen inches long and six round, beautifully

Didymus
Diemen's
Land.

Diemen's fully clouded with yellow and black. Among a variety of fish caught, were some large rays, nurses, leather-jackets, bream, soles, flounders, gurnards, and elephant-fish. Upon the rocks are muscles and other shell-fish, and upon the beach were found some pretty Medusa's heads. The most troublesome insects met with were the musquitoes; and a large black ant, the bit of which inflicts extreme pain.

The inhabitants seemed mild and cheerful, with little of that wild appearance which savages in general have. They are almost totally devoid of personal activity or genius, and are nearly upon a par with the wretched natives of Terra del Feugo. They display, however, some contrivance in their method of cutting their arms and bodies in lines of different directions, raised above the surface of the skin. Their indifference for presents offered them, their general inattention and want of curiosity, were very remarkable, and testified no acuteness of understanding. Their complexion is a dull black, which they sometimes heighten by smutting their bodies, as was supposed from their leaving a mark behind on any clean substance. Their hair is perfectly woolly, and is clotted with grease and red ochre like that of the Hottentots. Their noses are broad and full, and the lower part of the face projects considerably. Their eyes are of a moderate size; and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleasing cast. Their teeth are not very white nor well set, and their mouths are wide: they wear their beards long and clotted with paint. They are upon the whole well proportioned, though their belly is rather protuberant. Their favourite attitude is to stand with one side forward, and one hand grasping across the back the opposite arm, which on this occasion hangs down by the side that projects.

Near the shore in the bay were observed some wretched constructions of sticks covered with bark; but these seemed to have been only temporary, and they had converted many of their largest trees into more comfortable and commodious habitations. The trunks of these were hollowed out to the height of six or seven feet by means of fire. That they sometimes dwell in them was manifest from their hearths in the middle made of clay, round which four or five persons might sit. These places of shelter are rendered durable by their leaving one side of the tree sound, so that it continues growing with great luxuriance.

DIEMERBROEK (Ibrand), a learned professor of physic and anatomy at Utrecht, was born at Montfort, in Holland, in 1609, where he acquired great reputation by his lectures and his practice; and died at Utrecht in 1674. He wrote a treatise on the plague, which is esteemed; and several learned works in anatomy and medicine, which were printed at Utrecht in 1685 in folio.

DIEPPE, a handsome sea-port town of France, in Upper Normandy, in the territory of Caux; with a good harbour, an old castle, and two handsome moles. The parish-church of St James is an elegant structure; and there is a tower from which, in fine weather, the coast of England may be seen. The principal trade consists in herrings, whittings, mackerel, ivory, toys, and laces. It was bombarded by the English in 1694, and it is not now so considerable as it was formerly. It

is seated at the mouth of the river Argues, in E. Long. 1. 9. N. Lat. 49 55.

DIES MARCHIÆ, was the day of congress or meeting of the English and Scots, annually appointed to be held on the marches or borders, in order to adjust all differences between them.

DIESIS, in music, is the division of a tone less than a semitone; or an interval consisting of a less or imperfect semitone.

Diesis is the smallest and softest change or inflexion of the voice imaginable: it is called a *faint*, expressed thus X, by a St Andrew's cross or saltier.

DIESPITER, in antiquity, a name given to Jupiter; and signifying *diei pater*, "father of the day." St Augustin derives the name from *dies* "day," and *partus*, "production, bringing forth;" it being Jupiter that brings forth the day. Of which sentiment were Servius and Macrobius; the former adding, that in the language of the Oscei they called him *Lucentius*, as *Diespiter* in Latin.

DIET, in medicine, according to some, comprehends the whole regimen or rule of life with regard to the six non naturals; air, meats and drinks, sleep and watching, motion and rest, passions of the mind, retentions and excretions. Others restrain the term of *diet* to what regards eating and drinking, or solid aliments and drinks. See Food.

The natural constitution of the body of man is such, that it can easily bear some changes and irregularities without much injury. Had it been otherwise, we should be almost constantly put out of order by every slight cause. This advantage arises from those wonderful communications of the inward parts, whereby, when one part is affected, another comes immediately to its relief.

Thus, when the body is too full, nature causes evacuations through some of the outlets: and for this reason it is, that diseases from inanition are generally more dangerous than from repletion; because we can more expeditiously diminish than increase the juices of the body. Upon the same account, also, though temperance be beneficial to all men, the ancient physicians advised persons in good health, and their own masters, to indulge a little now and then, by eating and drinking more plentifully than usual. But, of the two, intemperance in drinking is safer than in eating: and if a person has committed excess in the latter, cold water drank upon a full stomach will help digestion; to which it will be of service to add lemon juice, or elixir of vitriol. If he has eaten high seasoned things, rich sauces, &c. then let him sit up for some little time, and afterwards sleep. But if a man happen to be obliged to fast, he ought to avoid all laborious work. From satiety it is not proper to pass directly to sharp hunger, nor from hunger to satiety: neither will it be safe to indulge absolute rest immediately after excessive labour, nor suddenly to fall to hard work after long idleness. In a word, therefore, all changes in the way of living should be made by degrees.

The softer and milder kinds of aliment are proper for children, and for youth the stronger. Old people ought to lessen the quantity of their food, and increase that of their drink: but yet some allowance is to be made for custom, especially in the colder climates like ours; for as in these the appetite is keener, so is the digestion.

Dies
||
Diet.

Diet
||
Dieu.

digestion better performed. *Mead's Monita & Precepta.*

DIET-Drinks, a form in physic, including all the medicated wines, ales, and wheys, used in chronic cases. They require a course or continuation to answer any intention of moment.

DIET of Appearance, in Scots law, the day to which a defender is cited to appear in court; and every other day to which the court shall afterwards adjourn the consideration of the question.

DIET, or *Dyet*, in matters of policy, is used for the general assembly of the states or circles of the empire of Germany and of Poland, to deliberate and concert measures proper to be taken for the good of the public.

The general diet of the empire is usually held at Ratisbon. It consists of the emperor, the nine electors, and the ecclesiastical princes; viz. the archbishops, bishops, abbots, and abbeesses; the secular princes, who are dukes, marquises, counts, viscounts, or barons; and the representatives of the imperial cities. It meets on the emperor's summons, and any of the princes may send their deputies thither in their stead. The diet makes laws, raises taxes, determines differences between the several princes and states, and can relieve the subjects from the oppressions of their sovereigns.

The diet of Poland, or the assembly of the states, consisted of the senate and deputies, or representative of every palatinate or county and city; and usually met every two years, and oftener upon extraordinary occasions, if summoned by the king, or, in his absence, by the archbishop of Gnesna. The general diet of Poland sat but six weeks, and often broke up in a tumult much sooner: for one dissenting voice prevented their passing any laws, or coming to any resolutions on what was proposed to them from the throne. Switzerland has also a general diet, which is usually held every year at Baden, and represents the whole Helvetic body: it seldom lasts longer than a month. Besides this general diet, there are diets of the Protestant cantons, and diets of the catholic ones: the first assemble at Araw, and are convoked by the canton of Zurich; the second at Lucern, convoked by the canton of that name.

DIETETIC, denotes something belonging to diet, but particularly that part of physic which treats of this subject. See **DIET**, **FOOD**, and **DRINK**.

DIETRICH, or **DIETRICH** (Christian William Ernest), a modern artist, who was born at Weimar in 1712. He resided chiefly at Dresden, where he was professor of the academy of arts. He was a painter of very extensive abilities, and succeeded both in history and landscape. We have by him a great number of small subjects, to the amount of 150 or more, which he engraved from his own compositions, in the style, says Basan, of Ostade of Laireffe, and of Salvator Rosa. Sixty of these etchings are exceedingly rare.

DIETS, a town in the circle of the Upper Rhine in Germany, situated on the river Lohn, twenty miles north of Mentz, and subject to the house of Nassau-Orange. E. Long. 7. 40. N. Lat. 50. 28.

DIEU ET MON DROIT, i. e. *God and my right*, the motto of the royal arms of England, first assumed by

king Richard I. to intimate that he did not hold his empire in vassalage of any mortal.

It was afterwards taken up by Edward III. and was continued without interruption to the time of the late king William, who used the motto *Je main tiendrai*, though the former was still retained upon the great seal. After him queen Anne used the motto *Semper eadem*, which had been before used by queen Elizabeth; but ever since queen Anne, *Dieu et mon droit* continues to be the royal motto.

DIFF, is the name of an instrument of music among the Arabs, serving chiefly to beat time to the voice: it is a hoop, sometimes with pieces of brass fixed to it to make a jingling, over which a piece of parchment is distended. It is beat with the fingers, and is the true *tympanum* of the ancients.

DIFFARREATION, among the Romans, a ceremony whereby the divorce of their priests was solemnized. The word comes from the preposition *dis*; which is used, in composition, for *division* or *separation*; and *farreatio*, a ceremony with wheat, of *far* "wheat."

Diffarreation was properly the dissolving of marriages contracted by confarreation; which were those of the pontifices or priests. Festus says, it was performed with a wheaten cake. Vigenere will have confarreation and diffarreation to be the same thing.

DIFFERENCE, in mathematics, is the remainder, when one number or quantity is subtracted from another.

DIFFERENCE, in logic, an essential attribute belonging to some species, and not found in the genus; being the idea that defines the species. Thus, body and spirit are the two species of substance, which in their ideas include something more than is included in the idea of substance. In body, for instance, is found impenetrability and extension; in spirit, a power of thinking and reasoning: so that the difference of body is impenetrable extension, and the difference of spirit is cogitation.

DIFFERENCE, in heraldry, a term given to a certain figure added to coats of arms, serving to distinguish one family from another; and to show how distant younger branches are from the elder or principal branch.

DIFFERENTIAL, **DIFFERENTIALE**, in the higher geometry, an infinitely small quantity, or a particle of quantity so small as to be less than any assignable one. It is called a *differential*, or *differential quantity*, because frequently considered as the difference of two quantities; and, as such, is the foundation of the *differential calculus*: Sir Isaac Newton, and the English, call it a *moment*, as being considered as the momentary increase of quantity. See **FLUXIONS**.

DIFFORM, **DIFFORMIS** (from *forma* "shape"), is a word used in opposition to *uniform*; and signifies, that there is no regularity in the form or appearance of a thing. The botanists use it as a distinction of the flowers of several species of plants.

DIFFUSE, an epithet applied to such writings as are wrote in a prolix manner. Among historians, Salust is reckoned sententious, and Livy diffuse. Thus also among the orators, Demosthenes is close and concise; Cicero, on the other hand, is diffuse.

DIFFUSION, the dispersion of the subtile effluvia of bodies into a kind of atmosphere all round them.

Diff
||
Diffusion.

Thus

Digastricus Thus the light diffused by the rays of the sun, issues all round from that amazing body of fire.

Digest.

DIGASTRICUS, in anatomy, a muscle of the lower jaw, called also *Biventer*. See ANATOMY, *Table of the Muscles*.

DIGBY (Sir Kenelm), became very illustrious in the 17th century for his virtue and learning. He was descended of an ancient family in England. His great-grandfather, accompanied by six of his brothers, fought valiantly at Bosworth-field on the side of Henry VII. against the usurper Richard III. His father, Everard, suffered himself to be engaged in the gun-powder plot against king James I. and for that crime was beheaded. His son wiped off that stain, and was restored to his estate. King Charles I. made him gentleman of the bed-chamber, commissioner of the navy, and governor of the Trinity-house. He granted him letters of reprisal against the Venetians, by virtue whereof he took several prizes with a small fleet which he commanded. He fought the Venetians near the port of Scanderoon, and bravely made his way through them with his booty. He was a great lover of learning, and translated several authors into English; and his "Treatise of the Nature of Bodies and the Immortality of the Soul," discovers great penetration and extensive knowledge. He applied to chemistry; and found out several useful medicines, which he gave freely away to people of all sorts, especially to the poor. He distinguished himself particularly by his sympathetic powder for the cure of wounds at a distance; his discourse concerning which made a great noise for a while. He had conferences with Des Cartes about the nature of the soul.

In the beginning of the civil wars, he exerted himself very vigorously in the king's cause; but he was afterwards imprisoned, by the parliament's order, in Winchester house, and had leave to depart thence in 1643. He afterwards compounded for his estate, but was ordered to leave the nation; when he went to France, and was sent on two embassies to pope Innocent X. from the queen, widow to Charles I. whose chancellor he then was. On the restoration of Charles II. he returned to London; where he died in 1665, aged 60.

This eminent person was, for the early pregnancy of his parts, and his great proficiency in learning, compared to the celebrated Picus de Mirandola, who was one of the wonders of human nature. His knowledge, though various and extensive, appeared to be greater than it really was; as he had all the powers of elocution and address to recommend it. He knew how to shine in a circle of ladies or philosophers; and was as much attended to when he spoke on the most trivial subjects, as when he spoke on the most important. It is said that one of the princes of Italy, who had no child, was desirous that his princess should bring him a son by Sir Kenelm, whom he esteemed a just model of perfection.

DIGEST, DIGESTUM, a collection of the Roman laws, ranged and digested under proper titles, by order of the emperor Justinian.

That prince gave his chancellor Tribonianus a commission for this purpose; who, in consequence thereof, chose sixteen jurisconsulti, or lawyers, to work upon the same. These, accordingly, took out the best and

finest decisions from the two thousand volumes of the ancient jurisconsulti, and reduced them all into one body; which was published in the year 533, under the name of the *Digest*. To this the emperor gave the force of a law, by a letter at the head of the work, which serves it as a preface.

The Digest makes the first part of the Roman law, and the first volume of the corpus or body of the civil law, contained in fifty books. It was translated into Greek under the same emperor, and called *Pandecta*. See PANDECTS.

Cujus says, that *Digest* is a common name for all books disposed in a good order and economy; and hence it is that Tertullian calls the Gospel of St Luke a Digest.

Hence also abridgements of the common law are denominated *digests* of the numerous cases, arguments, readings, pleadings, &c. dispersed in the year-books, and other reports and books of law, reduced under proper heads or common places. The first was that of Statham, which comes as low as Henry VI. That of Fitzherbert was published in 1516; Brook's in 1573, of which Hughes's, published in 1663, is a sequel. Rolls, Danvers, and Nelson, have also published Digests or abridgements of this kind, including the cases of later days; to which may be added the New Abridgement, Viner's Abridgement, &c.

DIGESTION, in the animal economy, is the dissolution of the aliments into such minute parts as are fit to enter the lacteal vessels, and circulate with the mass of blood. See ANATOMY, n° 102.

DIGESTION, in chemistry, is an operation which consists in exposing bodies to a gentle heat, in proper vessels, and during a certain time. This operation is very useful to favour the action of certain substances upon each other; as, for example, of well calcined, dry, fixed alkali upon rectified spirit of wine. When these two substances are digested together in a matras, with a gentle sand-bath heat, the spirit of wine acquires a yellow-reddish colour, and an alkaline quality. The spirit would not so well acquire these qualities by a stronger and shorter heat.

DIGESTIVE, in medicine, such remedies as strengthen and increase the tone of the stomach, and assist in the digestion of foods. To this class belong all stomachics and strengtheners or corroborants.

DIGESTIVE, in surgery, denotes a sort of unguent, plaster, or the like, that ripens and prepares the matter of wounds, &c. for suppuration.

DIGGING, among miners, is appropriated to the operation of freeing any kind of ore from the bed or stratum in which it lies, where every stroke of their tools turns to account: in contradistinction to the openings made in search of such ore, which are called *hatches*, or *essay-hatches*; and the operation itself, *tracing of mines*, or *hatching*.

When a bed of ore is discovered, the beele-men, so called from the instrument they use, which is a kind of pick-ax, free the ore from the fossils around it; and the shovel-men throw it up from one shamble to another, till it reaches the mouth of the hatch.

In some mines, to save the expence as well as fatigue of the shovel-men, they raise the ore by means of a winder and two buckets, one of which goes up as the other comes down.

DIGIT,

Digestion
Digging.

Digit
||
Dignitary.

DIGIT, in astronomy, the twelfth part of the diameter of the sun or moon, used to express the quantity of an eclipse. Thus an eclipse is said to be of six digits, when six of these parts are hid.

DIGITS, or *Monades*, in arithmetic, signify any integer under 10; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

DIGIT is also a measure taken from the breadth of the finger. It is properly $\frac{3}{4}$ ths of an inch, and contains the measure of four barley-corns laid breadthwise.

DIGITALIS, **FOX-GLOVE**: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 28th order, *Luride*. The calyx is quinquepartite; the corolla campanulated, quinquefid, and ventricose; the capsule ovate and bilocular.—There are six species; five of which are hardy, herbaceous, biennial, and perennial plants, and the sixth a tender shrubby exotic. The herbaceous species rise two or three feet high, crowned with spikes of yellow iron-coloured or purple flowers. The shrubby sort rises five or six feet high, having spear-shaped rough leaves, four or five inches long, and half as broad; the branches being all terminated with flowers growing in loose spikes. All the species are easily raised by seeds. An ointment made of the flowers of purple fox-glove and May-butter, is much commended by some physicians for scrophulous ulcers which run much and are full of matter. Taken internally, this plant is a violent purgative and emetic; and is therefore only to be administered to robust constitutions. The country people in England frequently use a decoction of it with polypody of the oak in epileptic fits. An infusion of two drams of the leaf in a pint of water, given in half-ounce doses every two hours or so, till it begin to puke or purge, is recommended in dropsy, particularly that of the breast. It is said to have produced an evacuation of water so copious and sudden, in ascites, by stool and urine, that the compression of bandages was found necessary. The plentiful use of diluents is ordered during its operation. The remedy, however, is inadmissible in very weakly patients. But besides being given in infusion, it has also been employed in substance. And when taken at bed-time to the extent of one, two, or three, grains of the dried powder, it often in a short time operates as a very powerful diuretic, without producing any other evacuation. Even this quantity, however, will sometimes excite very severe vomiting, and that too occurring unexpectedly. During its operation it has often very remarkable influence in rendering the pulse slower; and it frequently excites very considerable vertigo, and an affection of vision. Fox-glove has of late also been employed in some instances of hæmoptysis, of phthisis, and of mania, with apparent good effects: but its use in these diseases is much less common than in dropsy.

DIGITATED, among botanists. See **BOTANY**, p. 445, n° 230, and Plate CV. fig. 102.

DIGLYPH, in architecture, a kind of imperfect triglyph, console, or the like; with two channels or engravings, either circular or angular.

DIGNE, an episcopal town of Provence in France, famous for the baths that are near it. It is seated on a river called Marderic, in E. Long. 5. 27. N. Lat. 44. 45.

DIGNITARY, in the canon law, a person who

N° 101.

holds a dignity, that is, a benefice which gives him some pre-eminence over mere priests and canons. Such is a bishop, dean, arch-deacon, prebendary, &c. Dignity.

DIGNITY, as applied to the titles of noblemen, signifies honour and authority. And dignity may be divided into superior and inferior; as the titles of duke, earl, baron, &c. are the highest names of dignity; and those of baronet, knight, serjeant at law, &c. the lowest. Nobility only can give so high a name of dignity as to supply the want of a surname in legal proceedings; and as the omission of a name of dignity may be pleaded in abatement of a writ, &c. so it may be where a peer who has more than one name of dignity, is not named by the Most Noble. No temporal dignity of any foreign nation can give a man a higher title here than that of of **ESQUIRE**.

DIGNITY, in the human character, the opposite of *Meanness*.

Man is endued with a **SENSE** of the worth and excellence of his nature: he deems it more perfect than that of the other beings around him; and he perceives that the perfection of his nature consists in virtue, particularly in virtues of the highest rank. To express that sense, the term *dignity* is appropriated. Further, to behave with dignity, and to refrain from all mean actions, is felt to be, not a virtue only, but a duty: it is a duty every man owes to himself. By acting in that manner, he attracts love and esteem: by acting meanly, or below himself, he is disapproved and condemned.

This sense of the dignity of human nature reaches even our pleasures and amusements. If they enlarge the mind by raising grand or elevated emotions, or if they humanize the mind by exercising our sympathy, they are approved as suited to the dignity of our nature: if they contract the mind by fixing it on trivial objects, they are condemned as not suited to the dignity of our nature. Hence, in general, every occupation, whether of use or amusement, that corresponds to the dignity of man, is termed *manly*; and every occupation below his nature, is termed *childish*.

To those who study human nature, there is a point which has always appeared intricate: How comes it that generosity and courage are more esteemed, and bestow more dignity, than good-nature, or even justice; though the latter contribute more than the former to private as well as to public happiness? This question, bluntly proposed, might puzzle even a philosopher; but, by means of the foregoing observations, will easily be solved. Human virtues, like other objects, obtain a rank in our estimation, not from their utility, which is a subject of reflection, but from the direct impression they make on us. Justice and good-nature are a sort of negative virtues, that scarce make any impression but when they are transgressed: courage and generosity, on the contrary, producing elevated emotions, enliven greatly the sense of a man's dignity, both in himself and in others; and for that reason, courage and generosity are in higher regard than the other virtues mentioned: we describe them as grand and elevated, as of greater dignity, and more praise-worthy.

This leads us to examine more directly emotions and passions with respect to the present subject: and it will not be difficult to form a scale of them, beginning with the

Dignity. the meanest, and ascending gradually to those of the highest rank and dignity. Pleasure felt as at the organ of sense, named *corporeal pleasure*, is perceived to be low; and when indulged to excess, is perceived also to be mean: for that reason, persons of any delicacy dissemble the pleasure they take in eating and drinking. The pleasures of the eye and ear, having no organic feeling, and being free from any sense of meanness, are indulged without any shame: they even rise to a certain degree of dignity when their objects are grand or elevated. The same is the case of the sympathetic passions: a virtuous person behaving with fortitude and dignity under cruel misfortunes, makes a capital figure; and the sympathising spectator feels in himself the same dignity. Sympathetic distress at the same time never is mean: on the contrary, it is agreeable to the nature of a social being, and has general approbation. The rank that love possesses in the scale, depends in a great measure on its object: it possesses a low place when founded on external properties merely; and is mean when bestowed on a person of inferior rank without any extraordinary qualification: but when founded on the more elevated internal properties, it assumes a considerable degree of dignity. The same is the case of friendship. When gratitude is warm, it animates the mind; but it scarce rises to dignity. Joy bestows dignity when it proceeds from an elevated cause.

If we can depend upon induction, dignity is not a property of any disagreeable passion: one is slight, another severe; one depresses the mind, another animates it; but there is no elevation, far less dignity, in any of them. Revenge, in particular, though it enflame and swell the mind, is not accompanied with dignity, not even with elevation: it is not however felt as mean or groveling, unless when it takes indirect measures for gratification. Shame and remorse, though they sink the spirits, are not mean. Pride, a disagreeable passion, bestows no dignity in the eye of a spectator. Vanity always appears mean; and extremely so where founded, as commonly happens, on trivial qualifications.

We proceed to the pleasures of the understanding, which possess a high rank in point of dignity. Of this every one will be sensible, when he considers the important truths that have been laid open by science; such as general theorems, and the general laws that govern the material and moral worlds. The pleasures of the understanding are suited to man as a rational and contemplative being, and they tend not a little to ennoble his nature; even to the Deity he stretcheth his contemplations, which, in the discovery of infinite power, wisdom, and benevolence, afford delight of the most exalted kind. Hence it appears, that the fine arts, studied as a rational science, afford entertainment of great dignity; superior far to what they afford as a subject of taste merely.

But contemplation, however in itself valuable, is chiefly respected as subservient to action; for man is intended to be more an active than a contemplative being. He accordingly shows more dignity in action than in contemplation: generosity, magnanimity, heroism, raise his character to the highest pitch: these best express the dignity of his nature, and advance

him nearer to divinity than any other of his attributes. **Dignity.**

Having endeavoured to assign the efficient cause of dignity and meanness, by unfolding the principle on which they are founded, we proceed to explain the final cause of the dignity or meanness bestowed upon the several particulars above mentioned, beginning with corporeal pleasures. These, as far as useful, are, like justice, fenced with sufficient sanctions to prevent their being neglected: hunger and thirst are painful sensations; and we are incited to animal love by a vigorous propensity: were corporeal pleasures dignified over and above with a place in a high class, they would infallibly overturn the balance of the mind, by outweighing the social affections. This is a satisfactory final cause for refusing to these pleasures any degree of dignity: and the final cause is not less evident of their meanness when they are indulged to excess. The more refined pleasures of external sense, conveyed by the eye and the ear from natural objects and from the fine arts, deserve a high place in our esteem, because of their singular and extensive utility: in some cases they rise to a considerable dignity; and the very lowest pleasures of the kind are never esteemed mean or groveling. The pleasure arising from wit, humour, ridicule, or from what is simply ludicrous, is useful, by relaxing the mind after the fatigue of more manly occupation: but the mind, when it surrenders itself to pleasure of that kind, loses its vigour, and sinks gradually into sloth. The place this pleasure occupies in point of dignity, is adjusted to these views: to make it useful as a relaxation, it is not branded with meanness; to prevent its usurpation, it is removed from that place but a single degree: no man values himself for that pleasure, even during gratification; and if it have engrossed more of his time than is requisite for relaxation, he looks back with some degree of shame.

In point of dignity, the social emotions rise above the selfish, and much above those of the eye and ear: man is by his nature a social being; and to qualify him for society, it is wisely contrived, that he should value himself more for being social than selfish.

The excellency of man is chiefly discernible in the great improvements he is susceptible of in society: these, by perseverance, may be carried on progressively, above any assignable limits; and even abstracting from revelation, there is great probability, that the progress begun here will be completed in some future state. Now, as all valuable improvements proceed from the exercise of our rational faculties, the Author of our nature, in order to excite us to a due use of these faculties, hath assigned a high rank to the pleasures of the understanding: their utility, with respect to this life as well as a future, intitles them to that rank.

But as action is the aim of all our improvements, virtuous actions justly possess the highest of all the ranks. These, we find, are by nature distributed into different classes, and the first in point of dignity assigned to actions that appear not the first in point of use: generosity, for example, in the sense of mankind is more respected than justice, though the latter is undoubtedly more essential to society; and magnanimity,

heroism,

Dignity
||
Dii.

heroism, undaunted courage, rise still higher in our esteem: The reason of which is explained above.

DIGNITY, in oratory, is one of the three parts of general elocution; and consists in the right use of tropes and figures. See ORATORY, n° 48.

DIGON, an ancient, handsome, rich, and very considerable town of France; capital of Burgundy, and of the Digonois; with a parliament, bishop's see, a mint, an university, academy of sciences, an abbey, and a citadel: most part of the churches and public structures are very beautiful, and in one of the squares there is an equestrian statue of Louis XIV. It is seated in a very pleasant plain between two small rivers, which produces excellent wine. E. Long. 5. 7. N. Lat. 47. 19.

DIGRESSION, in oratory, is defined by Quintilian, agreeably to the etymology of the word, to be, a going off from the subject we are upon to some different thing, which, however, may be of service to it. See ORATORY, n° 37.

DIGYNIA, (from *dis* twice, and *gyn* a woman), the name of an order or secondary division in each of the first 13 classes, except the 9th, in Linnæus's sexual method; consisting of plants, which to the classic character, whatever it is, add the circumstance of having two styles or female organs.

DII, the divinities of the ancient inhabitants of the earth, were very numerous. Every object which caused terror, inspired gratitude, or bestowed affluence, received the tribute of veneration. Man saw a superior agent in the stars, the elements, or the trees, and supposed that the waters which communicated fertility to his fields and possessions, were under the influence and direction of some invisible power inclined to favour and to benefit mankind. Thus arose a train of divinities which imagination arrayed in different forms, and armed with different powers. They were endowed with understanding, and were actuated by the same passions which daily afflict the human race, and those children of superstition were appeased or provoked as the imperfect being which gave them birth. Their wrath was mitigated by sacrifices and incense, and sometimes human victims bled to expiate a crime, which superstition alone supposed to exist. The sun, from his powerful influence and animating nature, first attracted the notice and claimed the adoration of the uncivilized inhabitants of the earth. The moon also was honoured with sacrifices and addressed in prayers, and after immortality had been liberally bestowed on all the heavenly bodies, mankind classed among their deities the brute creation, and the cat and the fow shared equally with Jupiter himself, the father of gods and men, the devout veneration of their votaries. This immense number of deities have been divided into different classes according to the will and pleasure of the mythologists. The Romans, generally speaking, reckoned two classes of the gods, the *dii majorum gentium*, or *dii consules*, and the *dii minorum gentium*. The former were 12 in number, six males and six females. [*Vid.* CONSENTES.] In the class of the latter were ranked all the gods which were worshipped in different parts of the earth. Besides these there were some called *dii selecti*, sometimes classed with the 12 greater gods; these were Janus, Saturn, the Genius, the Moon, Pluto, and Bacchus. There were also some

called demi-gods, that is, who deserved immortality by the greatness of their exploits, and for their uncommon services to mankind. Among these were Priapus, Vertumnus, Hercules, and those whose parents were some of the immortal gods. Besides these, all the passions and the moral virtues were reckoned as powerful deities, and temples were raised to a goddess of concord, peace, &c. According to the authority of Hesiod, there were no less than 30,000 gods that inhabited the earth, and were guardians of men, all subservient to the power of Jupiter. To these, succeeding ages have added an almost equal number; and indeed they were so numerous, and their functions so various, that we find temples erected, and sacrifices offered, to unknown gods. It is observable, that all the gods of the ancients have lived upon earth as mere mortals; and even Jupiter, who was the ruler of heaven, is represented by the mythologists as a helpless child; and we are acquainted with all the particulars that attended the birth and education of Juno. In process of time, not only good and virtuous men, who had been the patrons of learning and the supporters of liberty, but also thieves and pirates, were admitted among the gods, and the Roman senate courteously granted immortality to the most cruel and abandoned of their emperors.

DIJAMBUS, in poetry, the foot of a Latin verse of four syllables; it is compounded of two *iambics*, as *sevēritās*.

DIKE, a ditch or drain, made for the passage of waters.—The word seems formed from the verb to *dig*; tho' others choose to derive it from the Dutch, *diik*, a dam, sea-bank, or wall.

DIKE, or *Dyke*, also denotes a work of stone, timber or fascines, raised to oppose the entrance or passage of the waters of the sea, a river, lake, or the like.—The word comes from the Flemish *dyk*, or *diik*, a heap of earth to bound or stem the water. Junius and Menage take the Flemish to have borrowed their word from the Greek *τεχος*, wall. Guichard derives it from the Hebrew *daghab*. These dikes are usually elevations of earth, with hurdles of stakes, stones, and other matters.

The dike of Rochelle is made with vessels fastened to the bottom. The dikes of Holland are frequently broke through, and drown large tracts of land.

DILAPIDATION, in law, a wasteful destroying or letting buildings, especially parsonage-houses, &c. run to decay, for want of necessary reparation. If the clergy neglect to repair the houses belonging to their benefices, the bishop may sequester the profits thereof for that purpose. And in these cases, a prosecution may be brought either in the spiritual court or at common law, against the incumbent himself, or against his executor or administrator.

DILATATION, in physics, a motion of the parts of any body, by which it is so expanded as to occupy a greater space. This expansive motion depends upon the elastic power of the body; whence it appears that dilatation is different from rarefaction, this last being produced by the means of heat.

DILATATOIRES, in anatomy, a name given to several muscles in the human body. See ANATOMY, Table of the Muscles.

DILATORY PLEAS, in law, are such as are put in

Dii
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Dilatory.

Dilatris in merely for delay; and there may be a demurrer to a dilatory plea, or the defendant shall be ordered to plead better, &c. The truth of dilatory pleas is to be made out by affidavit of the fact, &c. by stat. 4 and 5 Anne. See **PLEA**.

DILATRIS, in botany: A genus of the monogynia order, belonging to the triandria class of plants. There is no calyx; the corolla has six petals, and is shaggy; the stigma simple.

DILEMMA, in logic, an argument equally conclusive by contrary suppositions. See **LOGIC**.

DILIGENCE, in Scots law, signifies either that care and attention which parties are bound to give, in implementing certain contracts or trusts, and which varies according to the nature of the contract; as to which, see **LAW**, N^o clxi. 12, 13. clxxiii. 8. & clxxxi. 18. Or it signifies certain forms of law, whereby the creditor endeavours to operate his payment, either by affecting the person or estate of the debtor; *ibid.* N^o clxxi. clxxii.

DILL, in botany. See **ANETHUM**.

DILLEMBURG, a town of Germany, in Wetteravia, and capital of a county of the same name. It is subject to a prince of the house of Nassau, and is situated in E. Long. 8. 24. N. Lat. 50. 45.

DILLENGEN, a town of Germany, in the circle of Suabia, with an university, and where the bishop of Augsburg resides. It is seated near the Danube, in E. Long. 11. 35. N. Lat. 48. 38.

DILLENIA, in botany, a genus of the polygynia belonging to the polyandria class of plants. The calyx is pentaphyllous; the petals five; the capsules numerous, polyspermous, coalited, and full of pulp.

DILUTE. To dilute a body is to render it liquid; or, if it were liquid before, to render it more so, by the addition of a thinner thereto. These things thus added are called *diluents*, or *dilutors*.

DIMACHÆ, (from *dis* double, and *μαχη* I fight,) in antiquity, a kind of horsemen, first instituted by Alexander. Their armour was lighter than that of the infantry, and at the same time heavier than that used by horsemen, so that they could act as horse or foot as occasion required.

DIMENSION, in geometry, is either length, breadth, or thickness; hence, a line hath one dimension, *viz.* length; a superficies two, *viz.* length and breadth; and a body, or solid, has three, *viz.* length, breadth, and thickness.

DIMINUTION, in architecture, a contraction of the upper part of a column, by which its diameter is made less than that of the lower part*.

* See *Architecture*, m^o 38.

DIMINUTIVE, in grammar, a word formed from some other, to soften or diminish the force of it, or to signify a thing is little in its kind. Thus, *cellule* is a diminutive of *cell*, *globule* of *globe*, *hillock* of *hill*.

DIMISSION LETTERS, *Litteræ Dimissoriae*, in the canon law, a letter given by a bishop to a candidate for holy orders, having a title in his diocese, directed to some other bishop, and giving leave for the bearer to be ordained by him.

When a person produces letters of ordination or tonsure, conferred by any other than his own diocesan, he must at the same time produce the letters dimissory given by his own bishop, on pain of nullity.

Letters dimissory cannot be given by the chapter, *sede vacante*; this being deemed an act of voluntary jurisdiction, which ought to be reserved to the successor.

DIMÆRITÆ, a name given to the Apollinarists, who at first held, that the word only assumed a human body, without taking a reasonable soul like ours; but being at length convinced by formal texts of scripture, they allowed, that he did assume a soul, but without understanding; the word supplying the want of that faculty. From this way of separating the understanding from the soul, they became denominated *dimærites*, *q. d. dividers, separators*, of *δία* and *μοίρα*, I divide.

DINDYMA-ORUM, (Virgil,) from Dindymus-i; a mountain allotted by many to Phrygia. Strabo has two mountains of this name; one in Mysia near Cyzicus; the other in Gallograecia near Pessinus; and none in Phrygia. Ptolemy extends this ridge from the borders of Troas, through Phrygia to Gallograecia: though therefore there were two mountains called Dindymus in particular, both sacred to the mother of the gods, and none of them in Phrygia Major; yet there might be several hills and eminences in it, on which this goddess was worshipped, and therefore called *Dindyma* in general. Hence Cybele is surnamed *Dindymane*, (Horace.)

DINGWAL, a parliament-town of Scotland in the shire of Ross, seated on the frith of Cromarty, 15 miles west of the town of Cromarty. Near it runs the river Conel, famous for producing pearls. W. Long. 4. 15. N. Lat. 57. 45. Dingwal was a Scotch barony in the person of the duke of Ormond in right of his lady, but forfeited in 1715.

DINNER, the meal taken about the middle of the day.—The word is derived from the French *dîner*, which Du Cange derives from the barbarous Latin *disnare*. Henry Stephens derives it from the Greek *δειπνέειν*; and will have it wrote *dipner*. Menage deduces it from the Italian *definare*, "to dine"; and that from the Latin *definere*, "to leave off work."

It is generally agreed to be the most salutary to make a plentiful dinner, and to eat sparingly at supper. This is the general practice among us. The French, however, in imitation of the ancient Romans, defer their good cheer to the evening; and Bernardinus Paternus, an eminent Italian physician, maintains it to be the most wholesome method, in a treatise expressly on the subject.

The grand Tartar emperor of China, after he has dined, makes publication by his heralds, that he gives leave for all the other kings and potentates of the earth to go to dinner; as if they waited for his leave.

DINOCRATES, a celebrated architect of Macedonia, who rebuilt the temple of Ephesus, when burnt by Erostratus, with much more magnificence than before. Vitruvius informs us that Dinocrates proposed to Alexander the Great to convert mount Athos into the figure of a man, whose left hand should contain a walled city, and all the rivers of the mount flow into his right, and from thence into the sea! He also conceived a scheme for building the dome of the temple of Arsinoe at Alexandria, of loadstone; that should by its attraction uphold her iron image in the centre, suspended in the air! Projects which at least showed a vast extent of imagination.

Dio
||
Diocleia.

DIO CHRYSOSTOM that is, *Golden Mouth*, a celebrated orator and philosopher of Greece, in the first century, was born at Prusa in Bithynia. He attempted to persuade Vespasian to quit the empire; was hated by Domitian; but acquired the esteem of Trajan. This last prince took pleasure in conversing with him, and made him ride with him in his triumphal chariot. There are still extant, 80 of Dio's orations, and some other of his works: the best edition of which is that of Hermand Samuel Raimarus, in 1750, in folio.

DIOCESE, or **DIOCESS**, the circuit or extent of the jurisdiction of a **BISHOP**.—The word is formed from the Greek *διοικησις*, *government, administration*; formed, of *διοικω*, which the ancient glossaries render *administro, moderor, ordino*: hence *διοικησις της πολως*, the *administration or government of a city*.

DIOCESE is also used in ancient authors, &c. for the province of a **METROPOLITAN**.

Diocesis, *διοικησις*, was originally a civil government, or prefecture, composed of divers provinces.

The first division of the empire into dioceses is ordinarily ascribed to Constantine; who distributed the whole Roman state into four, viz. the diocese of Italy, the diocese of Illyria, that of the east, and that of Africa. And yet, long before Constantine, Strabo, who wrote under Tiberius, takes notice, lib. xiii. p. 432. that the Romans had divided Asia into dioceses; and complains of the confusion such a division occasioned in geography, Asia being no longer divided by people, but by dioceses, each whereof had a tribunal or court, where justice was administered. Constantine, then, was only the institutor of those large dioceses, which comprehended several metropolises and governments; the former dioceses only comprehending one jurisdiction or district, or the country that had resort to one judge, as appears from this passage in Strabo, and (before Strabo) from Cicero himself, lib. iii. *epist. ad famil.* 9. and lib. xiii. *ep.* 67.

Thus, at first a province included divers dioceses; and afterwards a diocese came to comprise divers provinces. In after times the Roman empire became divided into 13 dioceses or prefectures; though, including Rome, and the suburbicary regions, there were 14. These 14 dioceses comprehended 120 provinces: each province had a proconsul, who resided in the capital or metropolis; and each diocese of the empire had a consul, who resided in the principal city of the district.

On this civil constitution, the ecclesiastical one was afterwards regulated: each diocese had an ecclesiastical vicar or primate, who judged finally of all the concerns of the church within his territory.

At present there is some further alteration: for diocese does not now signify an assemblage of divers provinces; but is limited to a single province under a metropolitan, or more commonly to the single jurisdiction of a bishop.

Gul. Brito affirms diocese to be properly the territory and extent of a baptismal or parochial church; whence divers authors use the word to signify a simple parish. See **PARISH**.

DIOCLEIA, *Διοκλεια*, in antiquity, a solemnity kept in the spring at Megara, in memory of the Athenian hero, who died in the defence of the youth he loved.

Dioclesi-
anus
||
Diodon.

DIOCLESIANUS (Caius Valerius Jovius), a celebrated Roman emperor born of an obscure family in Dalmatia in 245. He was first a common soldier, and by merit and success he gradually rose to the office of a general; and at the death of Numerian in 284 he was invested with imperial power. In this high station he rewarded the virtues and fidelity of Maximian, who had shared with him all the subordinate offices in the army, by making him his colleague on the throne. He created two subordinate emperors Constantius and Galerius, whom he called Cæsars, whilst he claimed for himself and his colleague the superior title of Augustus. Dioclesian has been celebrated for his military virtues; and though he was naturally unpolished by education and study, yet he was the friend and patron of learning and true genius. He was bold and resolute, active and diligent, and well acquainted with the arts, which will endear a sovereign to his people, and make him respectable even in the eyes of his enemies. His cruelty, however, against the followers of Christianity, has been deservedly branded with infamy. After he had reigned 22 years in the greatest prosperity, he publicly abdicated the crown at Nicomedia in 305, and retired to a private station at Salona. Maximian his colleague followed his example, but not from voluntary choice; and when he some time after endeavoured to rouse the ambition of Dioclesian, and persuade him to re-assume the imperial purple, he received for answer, that Dioclesian took now more delight in cultivating his little garden than he formerly enjoyed in a palace, when his power was extended over all the earth. He lived nine years after his abdication in the greatest security and enjoyment at Salona, and died in 314, in the 68th year of his age. Dioclesian is the first sovereign who voluntarily resigned his power. His bloody persecution of the Christians forms a chronological era, called the *era of Dioclesian*, or of the martyrs. It was for a long time in use in theological writings, and is still followed by the Copts and Abyssinians. It commenced August 29. 284.

DIOCTAHEDRIA, in natural history, a genus of pellucid and crystalliform spars, composed of two octangular pyramids, joined base to base, without any intermediate column. Of these some have long pyramids, others short and sharp-pointed ones, and others short and obtuse-pointed ones; the two former species being found in the Hartz-forest, and the last in the mines of Cornwall.

DIODATI (John), a famous minister, and professor of theology at Geneva, was born at Lucca in 1579, and died at Geneva in 1652. He is distinguished by translations, 1. of the Bible into Italian, with notes, Geneva 1607, 4to. The best edition at Geneva in 1641, folio. This is said to be more a paraphrase than a translation, and the notes rather divine meditations than critical reflections. 2. Of the Bible into French, Geneva, 1644. 3. Of Father Paul's History of the Council of Trent into French.

DIODIA, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 47th order, *Stellata*. The corolla is monopetalous and funnel-shaped; the capsule bilocular and dispermous.

DIODON, or **SUN-FISH**, in ichthyology, a genus belonging to the order of amphibia nantes.

There

Diodon,
Diodorus.

There are three species. 1. The oblong sun-fish grows to a great bulk: one examined by Sylvianus was above 100 pounds in weight; and Dr Borlase mentions another taken at Plymouth in 1734, that weighed 500. In form it resembles a bream or some deep fish cut off in the middle. The mouth is very small, and contains in each jaw two broad teeth, with sharp edges. The eyes are little; before each is a small semilunar aperture; the pectoral fins are very small, and placed behind them. The colour of the back is dusky, and dappled; the belly silvery: between the eyes and the pectoral fins are certain streaks pointing downwards. The skin is free from scales.

When boiled, it has been observed to turn into a glutinous jelly, resembling boiled starch when cold, and served the purposes of glue on being tried on paper and leather. The meat of this fish is uncommonly rank: it feeds on shell-fish.

There seems to be no satisfactory reason for the old English name. Care must be taken not to confound it with the sun-fish of the Irish (see *SQUALUS*), which differs in all respects from this.

2. The mola, or short sun-fish, differs from the former, in being much shorter and deeper. The back and the anal fins are higher, and the aperture to the gills not semilunar, but oval. The situation of the fins are the same in both.

Both kinds are taken on the western coasts of this kingdom, but in much greater numbers in the warmer parts of Europe.—Mr Brunnich informs us, that between Antibes and Genoa he saw one of this species lie asleep on the surface of the water: a sailor jumped overboard and caught it.

See Plate
CLXIV.

3. The levigatus, or globe, is common to Europe and South Carolina. As yet only a single specimen has been discovered in our seas; taken at Penzance in Cornwall. The length was one foot seven: the length of the belly, when distended, one foot; the whole circumference in that situation two feet six. The form of the body is usually oblong; but when alarmed, it has the power of inflating the belly to a globular shape of great size. This seems designed as a means of defence against fish of prey: as they have less means of laying hold of it; and are besides terrified by the numbers of spines with which that part is armed, and which are capable of being erected on every part. The mouth is small: the irides white, tinged with red: the back from head to tail almost straight, or at least very slightly elevated; of a rich deep blue colour. It has the pectoral, but wants the ventral fins: the tail is almost even, divided by an angular projection in the middle; tail and fins brown. The belly and sides are white, shagreened or wrinkled; and beset with innumerable small sharp spines, adhering to the skin by four processes.

DIODORUS, an historian, surnamed *Siculus*, because he was born at Argyra in Sicily. He wrote an history of Egypt, Persia, Syria, Media, Greece, Rome, and Carthage; and it is said that he visited all the places of which he has made mention in his history. It was the labour of 30 years. He is, however, too credulous in some of his narrations; and often wanders far from the truth. He often dwells too long upon fabulous reports and trifling incidents; while events of the greatest importance to history are treated with brevity, and sometimes passed over in silence. He lived

in the age of J. Caesar and Augustus; and spent much time at Rome to procure information, and authenticate his historical narrations. This important work, which he composed in Greek, contained 40 books, of which there are only 15 remaining. The style is clear and neat, and very suitable to history. The best edition is that of Amsterdam, 1743, in 2 vols folio.

DIOECIA, (from *dis twice*, and *oikia a house* or *habitation*) two houses. The name of the 22d class in Linnæus's sexual method, consisting of plants, which having no hermaphrodite flowers, produce male and female flowers on separate roots. These latter only ripen seeds; but require for that purpose, according to the sexualists, the vicinity of a male plant; or the asperion, that is, sprinkling, of the male dust. From the seeds of the female flowers are raised both male and female plants. The plants then in the class dioecia are all male and female; not hermaphrodite, as in the greater number of classes; nor with male and female flowers upon one root, as in the class monœcia of the same author. See BOTANY, p. 430.

DIOGENES of Apollonia, in the island of Crete, held a considerable rank among the philosophers who taught in Ionia before Socrates appeared at Athens. He was the scholar and successor of Anaximenes, and in some measure rectified his master's opinion concerning air being the cause of all things. It is said, that he was the first who observed that air was capable of condensation and rarefaction. He passed for an excellent philosopher, and died about the 450th year before the Christian era.

DIOGENES the Cynic, a famous philosopher, was the son of a banker of Sinope in Pontus. Being banished with his father for coining false money, he retired to Athens, where he studied philosophy under Antisthenes. He added new degrees of austerity to the sect of the Cynics, and never did any philosopher carry so far a contempt for the conveniences of life. He was one of those extraordinary men who run every thing to extremity, without excepting even reason itself; and who confirm the saying, that "there is no great genius without a tincture of madness." He lodged in a tub; and had no other moveables besides his staff, wallet, and wooden bowl, which last he threw away on seeing a boy drink out of the hollow of his hand. He used to call himself a vagabond, who had neither house nor country; was obliged to beg, was ill clothed, and lived from hand to mouth: and yet, says Ælian, he took as much pride in these things as Alexander could in the conquest of the world. He was not indeed a jot more humble than those who are clothed in rich apparel, and fare sumptuously every day. He looked down on all the world with scorn; he magisterially censured all mankind, and thought himself unquestionably superior to all other philosophers. Alexander one day paid him a visit, and made him an offer of riches or any thing else: but all that the philosopher requested of him was, to stand from betwixt the sun and him. As if he had said, "Do not deprive me of the benefits of nature, and I leave to you those of fortune." The conqueror was so affected with the vigour and elevation of his soul, as to declare, that "if he was not Alexander, he would choose to be Diogenes:" that is, if he was not in possession of all that was pompous and splendid in life, he would, like Diogenes, heroically despise it.

Diogenes

Diogenes. Diogenes had great presence of mind, as appears from his smart sayings and quick repartees; and Plato seems to have hit off his true character when he called him a Socrates run mad. He spent a great part of his life at Corinth, and the reason of his living there was as follows: As he was going over to the island of Ægina, he was taken by pirates, who carried him into Crete, and there exposed him to sale. He answered the crier, who asked him what he could do, that "he knew how to command men:" and perceiving a Corinthian who was going by, he showed him to the crier, and said, "Sell me to that gentleman, for he wants a master." Xenocrates, for that was the Corinthian's name, bought Diogenes, and carried him with him to Corinth. He appointed him tutor to his children, and entrusted him also with the management of his house. Diogenes's friends being desirous of redeeming him, "You are fools, (said he); the lions are not the slaves of those who feed them, but they are the servants of the lions." He therefore plainly told Xenocrates, that he ought to obey him, as people obey their governors and physicians. Some say, that Diogenes spent the remainder of his life in Xenocrates's family; but Dion Chrysostom asserts that he passed the winter at Athens, and the summer at Corinth. He died at Corinth when he was about 90 years old: but authors are not agreed either as to the time or manner of his death. The following account, Jerom says, is the true one. As he was going to the Olympic games, a fever seized him in the way; upon which he lay down under a tree, and refused the assistance of those who accompanied him, and who offered him either a horse or a chariot. "Go you to the games, (says he), and leave me to contend with my illness. If I conquer, I will follow you: If I am conquered, I shall go to the shades below." He dispatched himself that very night; saying, that "he did not so properly die, as get rid of his fever." He had for his disciples Onesicritus, Phocion, Stilpo of Megara, and several other great men. His works are lost.

DIAGENES Laertius, so called from Laerta in Cilicia where he was born, an ancient Greek author, who wrote ten books of the Lives of the Philosophers, still extant. In what age he flourished, is not easy to determine. The oldest writers who mention him are Socrates Alexandrinus, who lived in the time of Constantine the Great, and Hesychius Milesius, who lived under Justinian. Diogenes often speaks in terms of approbation of Plutarch and Phavorinus; and therefore, as Plutarch lived under Trajan, and Phavorinus under Hadrian, it is certain that he could not flourish before the reigns of those emperors. Menage has fixed him to the time of Severus; that is, about the year of Christ 200. From certain expressions in him some have fancied him to have been a Christian; but, as Menage observes, the immoderate praises he bestows upon Epicurus will not suffer us to believe this, but incline us rather to suppose that he was an Epicurean. He divided his Lives into books, and inscribed them to a learned lady of the Platonic school, as he himself intimates in his life of Plato. Montaigne was so fond of this author, that instead of one Laertius he wishes we had a dozen; and Vossius says, that his work is as precious as gold. Without doubt we are greatly obliged to him for what we know of the ancient philoso-

phers; and if he had been as exact in the writing part, as he was judicious in the choice of his subject, we had been more obliged to him still. Bishop Burnet, in the preface to his Life of Sir Matthew Hale, speaks of him in the following proper manner: "There is no book the ancients have left us (says he), which might have informed us more than Diogenes Laertius's Lives of the Philosophers, if he had had the art of writing equal to that great subject which he undertook: for if he had given the world such an account of them as Gassendus has done of Peiresc, how great a stock of knowledge might we have had, which by his unskilfulness is in a great measure lost? since we must now depend only on him, because we have no other and better author who has written on that argument." There have been several editions of his Lives of the Philosophers; but the best is that printed in two volumes 4to, at Amsterdam, 1693. This contains the advantages of all the former, besides some peculiar to itself: the Greek text and the Latin version corrected and amended by Meibomius; the entire notes of Henry Stephens, both the Casaubons, and of Menage; 24 copper-plates of philosophers elegantly engraved: to which is added, The History of the Female Philosophers, written by Menage, and dedicated to Madam Dacier. Besides this, Laertius wrote a book of Epigrams upon illustrious Men, called Pammetrus, from its various kinds of metre: but this is not extant.

DIOMEDIA, in ornithology, a genus belonging to the order of anseres. The bill is strait; the superior mandible is crooked at the point, and the lower one is truncated; the nostrils are oval, open, a little prominent, and placed on the sides. There are two species, viz. 1. The exulans, has pennated wings, and three toes on each foot. It is the albatross of Edwards; and is about the size of a pelican. These birds are found in the ocean betwixt the tropics and at the Cape of Good Hope. They are also often seen in vast flocks in Kamtschatka, and adjacent islands, about the end of June, where they are called *Great Gulls*; but it is chiefly in the bay of Penschineski, the whole inner sea of Kamtschatka, the Kurile isles, and that of Bering; for on the eastern coasts of the first they are scarce, a single straggler only appearing now and then. Their chief motive for frequenting these places seems to be plenty of food; and their arrival is a sure presage of shoals of fish following. At their first coming they are very lean, but soon grow immensely fat. Are very voracious birds, and will often swallow a salmon of four or five pounds weight; but as they cannot take the whole of it into their stomach at once, part of the tail end will often remain out of the mouth; and the natives, finding the bird in this situation, make no difficult matter of knocking it on the head on the spot. Before the middle of August they migrate elsewhere. They are often taken by means of a hook baited with a fish; but it is not for the sake of their flesh that they are valued, it being hard and unfavoury, but on account of the intestines, a particular part of which they blow up as a bladder, to serve as floats to buoy up their nets in fishing. Of the bones they make tobacco-pipes, needle-cases, and other useful things. When caught they defend themselves stoutly with the bill. Their cry is harsh and disagreeable, not unlike the braying of an ass. The breeding

Diomedes, breeding places of the albatross, if at all in the northern hemisphere, have not yet been pointed out; but we are certain of their multiplying in the southern, viz. Patagonia and Falkland islands: to this last place they come about the end of September or beginning of October, among other birds, in great abundance. The nests are made on the ground with earth, are round in shape, a foot in height, indented at top. The egg larger than that of a goose, four inches and a half long, white, marked with dull spots at the bigger end; and is thought to be good food, the white never growing hard with boiling. While the female is sitting, the male is constantly on the wing, and supplies her with food: during this time they are so tame as to suffer themselves to be shoved off the nest while their eggs are taken from them; but their chief destruction arises from the hawk, which, the moment the female gets off the nest, darts thereon, and flies away with the egg. The albatross itself likewise has its enemy, being greatly persecuted while on the wing by the dark grey gull called *skua*.

This bird attacks it on all sides, but particularly endeavours to get beneath, which is only prevented by the first settling on the water; and indeed they do not frequently fly at a great distance from the surface, except obliged so to do by high winds or other causes. As soon as the young are able to remove from the nest, the penguins take possession, and hatch their young in turn. It is probable that they pass from one part of the globe to another according to the season; being now and then met with by different voyagers at various times in intermediate places. The food is supposed to be chiefly small marine animals, especially of the molluscæ or blubber class, as well as flying fish. 2. The demersa, has no quill-feathers on the wings; and the feet have four toes, connected together by a membrane. It is the black penguin of Edwards, about the size of a goose, and is found at the Cape of Good Hope. It is an excellent swimmer and diver; but hops and flutters in a strange awkward manner on the land, and, if hurried, stumbles perpetually, and frequently runs for some distance like a quadruped, making use of the wings instead of legs, till it can recover its upright posture; crying out at the same time like a goose, but in a much hoarser voice. It is said to clamber some way up the rocks in order to make the nest; in doing which, has been observed to assist with the bill. The eggs are two in number, white, as large as those of a duck, and reckoned delicious eating, at least are thought so at the Cape, where they are brought in great numbers for that purpose. At this place the birds are often seen kept tame; but in general they do not survive the confinement many months.

DIOMEDES, son of Tydeus and Deiphyle, was king of Ætolia, and one of the bravest of the Grecian chiefs in the Trojan war. He often engaged Hector and Æneas, and obtained much military glory. He went with Ulysses to steal the Palladium from the temple of Minerva in Troy; and assisted in murdering Rhesus king of Thrace, and carrying away his horses. At his return from the siege of Troy, he lost his way in the darkness of night, and landed in Attica, where his companions plundered the country and lost the Trojan Palladium. During his long absence, his wife Ægiale

forgot her marriage vows, and prostituted herself to Cometes one of her servants. This lasciviousness of the queen was attributed by some to the resentment of Venus, whom Diomedes had severely wounded in a battle before Troy. The infidelity of Ægiale was highly displeasing to Diomedes. He resolved to abandon his native country which was the seat of his disgrace; and the attempts of his wife to take away his life, according to some accounts, did not a little contribute to hasten his departure. He came to that part of Italy which has been called *Magna Græcia*, where he built a city, which he called *Argyrippa*, and married the daughter of Daunus the king of the country. He died there in extreme old age; or, according to a certain tradition, he perished by the hand of his father-in-law. His death was greatly lamented by his companions, who in the excess of their grief were changed into birds resembling swans. These birds took flight into a neighbouring island in the Adriatic, and became remarkable for the tameness with which they approached the Greeks, and for the horror with which they shunned all other nations. They are called the birds of Diomedes. Altars were raised to Diomedes, as to a god, one of which Strabo mentions at Timavus.

DION, a Syracusan, son of Hipparinus, famous for his power and abilities. He was related to Dionysius, and often advised him together with the philosopher Plato, who at his request had come to reside at the tyrant's court, to lay aside the supreme power. His great popularity rendered him odious in the eyes of the tyrants, who banished him to Greece. There he collected a numerous force, and resolved to free his country from tyranny. This he easily effected on account of his uncommon popularity. He entered the port of Syracuse only in two ships; and in three days reduced under his power an empire which had already subsisted for 50 years, and which was guarded by 500 ships of war, and above 100,000 troops. The tyrant fled to Corinth, and Dion kept the power in his own hands, fearful of the aspiring ambition of some of the friends of Dionysius: but he was shamefully betrayed and murdered by one of his familiar friends called *Callicrates*, or *Callippus*, 354 years before the Christian era.

DION CASSIUS, a native of Nicæa in Bithynia. His father's name was Apronianus. He was raised to the greatest offices of state in the Roman empire by Pertinax, and his three successors. He was naturally fond of study, and he improved himself by unwearied application. He was ten years in collecting materials for an history of Rome, which he made public in 80 books, after a laborious employment of 12 years in composing it. This valuable history began with the arrival of Æneas in Italy, down to the reign of the emperor Alexander Severus. The 34 first books are totally lost, the 20 following, that is from the 35th to the 54th, remain entire, the six following are mutilated, and fragments is all that we possess of the last 20. In the compilation of this extensive history, Dion proposed himself Thucydides for a model, but he is not perfectly happy in his imitation. His style is pure and elegant, and his narrations are judiciously managed, and his reflections learned; but upon the whole, he is credulous,

Diomedes
||
Dion.

Dionis,
Dionæa.

credulous, and the bigoted slave of partiality, satyr, and flattery. He inveighs against the republican principles of Brutus and Cicero, and extols the cause of Cæsar. Seneca is the object of his satyr, and he represents him as debauched and licentious in his morals.

DIONIS (Peter), a famous surgeon, born at Paris, distinguished himself by his skill in his profession, and by his works; the principal of which are, 1. A course of operations in surgery; 2. The anatomy of man; and, 3. A treatise on the manner of assisting women in child-birth. He died in 1718.

DIONÆA MUSCIPULA, or *Venus's Fly-trap*, in botany, a newly discovered sensitive plant.

Every one skilled in natural history knows, that the mimosa, or sensitive plants, close their leaves, and bend their joints, upon the least touch: and this has astonished us; but no end or design of nature has yet appeared to us from these surprising motions: they soon recover themselves again, and their leaves are expanded as before. But the plant we are now going to describe, shows that nature may have some view towards its nourishment, in forming the upper joint of its leaf like a machine to catch food: upon the middle of this lies the bait for the unhappy insect that becomes its prey. Many minute red glands that cover its inner surface, and which perhaps discharge some sweet liquor, tempt the poor animal to taste them; and the instant these tender parts are irritated by its feet, the two lobes rise up, grasp it fast, lock the two rows of spines together, and squeeze it to death. And further, lest the strong efforts for life, in the creature thus taken, should serve to disengage it, three small erect spines are fixed near the middle of each lobe among the glands, that effectually put an end to all its struggles. Nor do the lobes ever open again, while the dead animal continues there. But it is nevertheless certain, that the plant cannot distinguish an animal from a mineral substance; for, if we introduce a straw or a pin between the lobes, it will grasp it full as fast as if it was an insect.—The plant is one of the monogynia order, belonging to the decandria class. It grows in America, about 35 deg. N. Lat. in wet shady places, and flowers in July and August. The largest leaves are about three inches long, and an inch and half across the lobes: the glands of those exposed to the sun are of a beautiful red colour; but those in the shade are pale, and inclining to green. The roots are squamous, sending forth but few fibres, and are perennial. The leaves are numerous, inclining to bend downwards, and are placed in a circular order; they are jointed and succulent; the lower joint, which is a kind of stalk, is flat, longish, two-edged, and inclining to heart-shaped. In some varieties they are serrated on the edges near the top. The upper joint consists of two lobes; each lobe is of a semi-oval form, with their margins furnished with stiff hairs like eye-brows, which embrace or lock in each other when they close: this they do when they are inwardly irritated. The upper surfaces of these lobes are covered with small red glands; each of which appears, when highly magnified, like a compressed arbutus berry.—Among the glands, about the middle of each lobe, are three very small erect spines. When the lobes inclose any sub-

N^o 101.

stance, they never open again while it continues there. If it can be shoved out so as not to strain the lobes, they expand again; but if force is used to open them, so strong has nature formed the spring of their fibres, that one of the lobes will generally snap off rather than yield. The stalk is about six inches high, round, smooth, and without leaves; ending in a spike of flowers. The flowers are milk-white, and stand on footstalks, at the bottom of which is a little painted bractea or flower-leaf. The soil in which it grows, as appears from what comes about the roots of the plants when they are brought over, is a black, light, mould, intermixed with white sand, such as is usually found in our moorish heaths. Being a swamp plant, a north-east aspect will be properest for it at first, to keep it from the direct rays of the sun; and in winter, till we are acquainted with what cold weather it can endure, it will be necessary to shelter it with a bell-glass, such as is used for melons. This should be covered with straw or a mat in hard frosts. By this means several of these plants have been preserved through the winter in a very vigorous state. Its sensitive quality will be found in proportion to the heat of the weather, as well as the vigour of the plant. Our summers are not warm enough to ripen the seed; or possibly we are not yet sufficiently acquainted with the culture of it. In order to try further experiments on its sensitive powers, some of the plants might be placed in pots of light moorish earth, and placed in pans of water, in an airy stove in summer; where the heat of such a situation, being like that of its native country, will make it surprisingly active.

DIONYSIA, in Grecian antiquity, solemnities in honour of Bacchus, sometimes called by the general name of *Orgia*; and by the Romans *Bacchanalia*, and *Liberalia*. See BACCHANALIA and BACCHUS.

DIONYSIACA, in antiquity, was a designation given to plays and all manner of sports acted on the stage; because play-houses were dedicated to Dionysius, i. e. Bacchus and Venus, as being the deities of sports and pleasure.

DIONYSIAN PERIOD. See CHRONOLOGY, n^o 31.

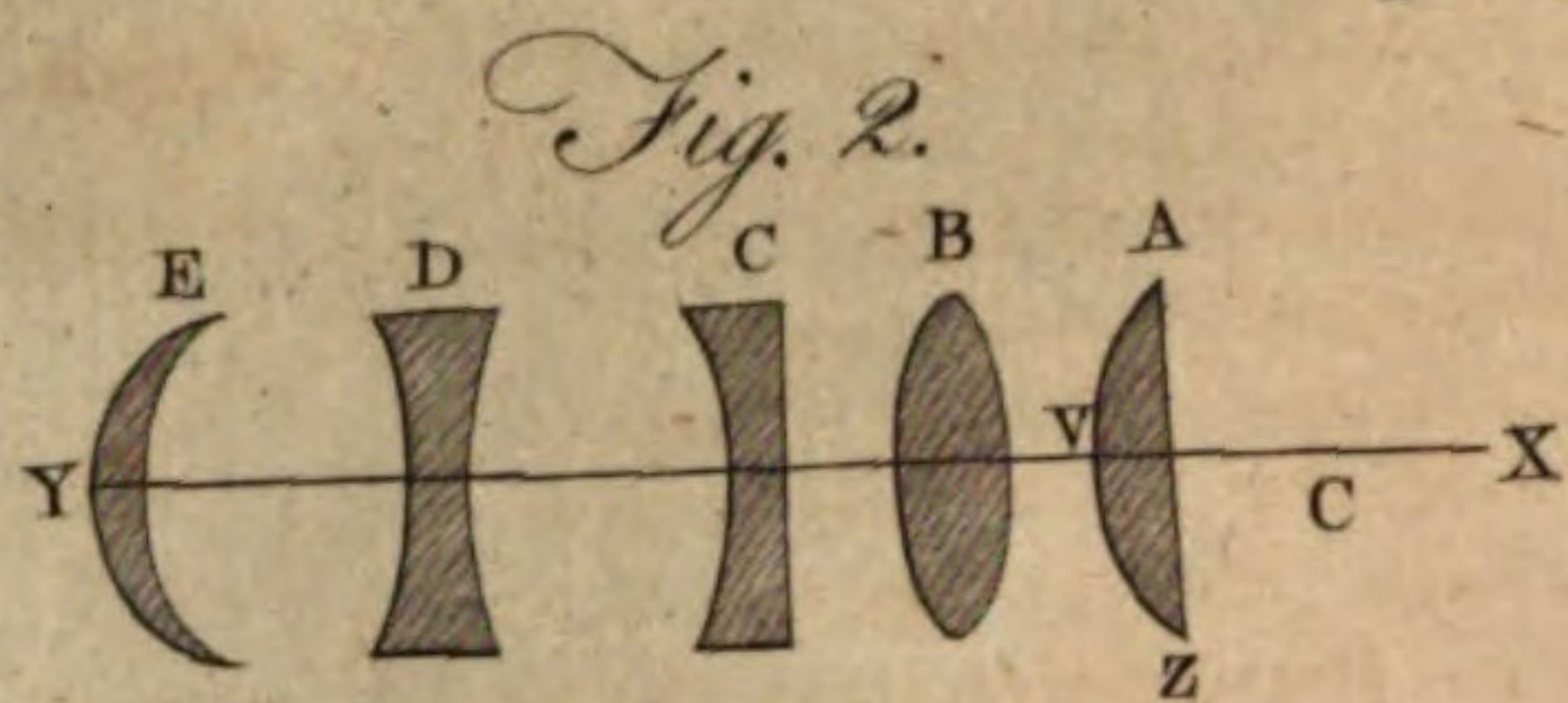
DIONYSIUS I. from a private secretary became general and tyrant of Syracuse and all Sicily. He was likewise a poet; and having, by bribes, gained the tragedy-prize at Athens, he indulged himself so immoderately at table from excess of joy, that he died of the debauch, 386 B. C. but some authors relate that he was poisoned by his physicians.

DIONYSIUS II. (his son and successor) was a greater tyrant than his father: his subjects were obliged to apply to the Corinthians for succour; and Timoleon their general having conquered the tyrant, he fled to Athens, where he was obliged to keep a school for subsistence. He died 343 B. C.

DIONYSIUS (Halicarnassensis), a celebrated historian, and one of the most judicious critics of antiquity, was born at Halicarnassus; and went to Rome after the battle of Actium, where he staid 22 years under the reign of Augustus. He there composed in Greek his History of the Roman Antiquities, in 20 books, of which the first 11 only are now remaining. There are also still extant several of his critical works. The best edition of the works of this author is that of

Oxford,

Dionæa
||
Dionysius.



DIVISIBILITY.

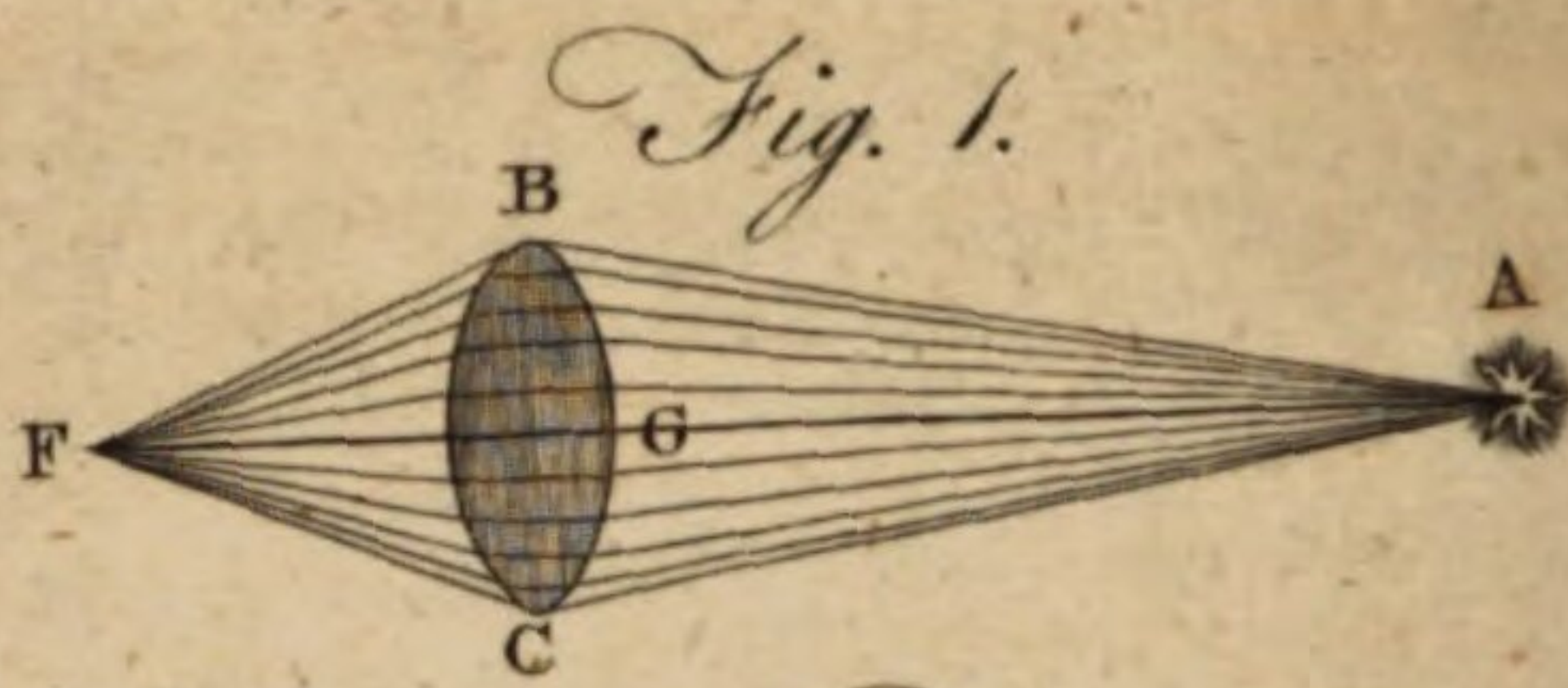
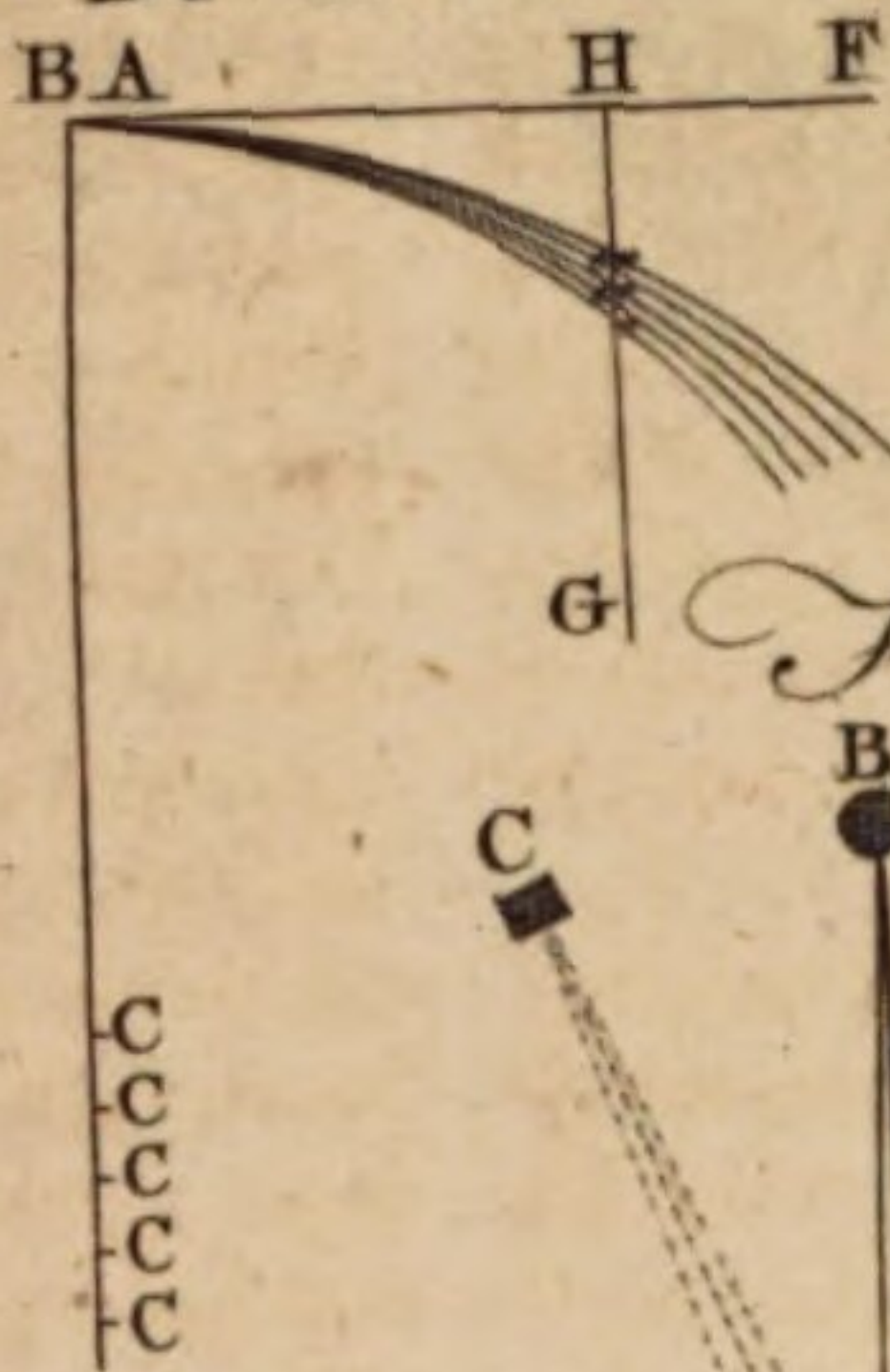


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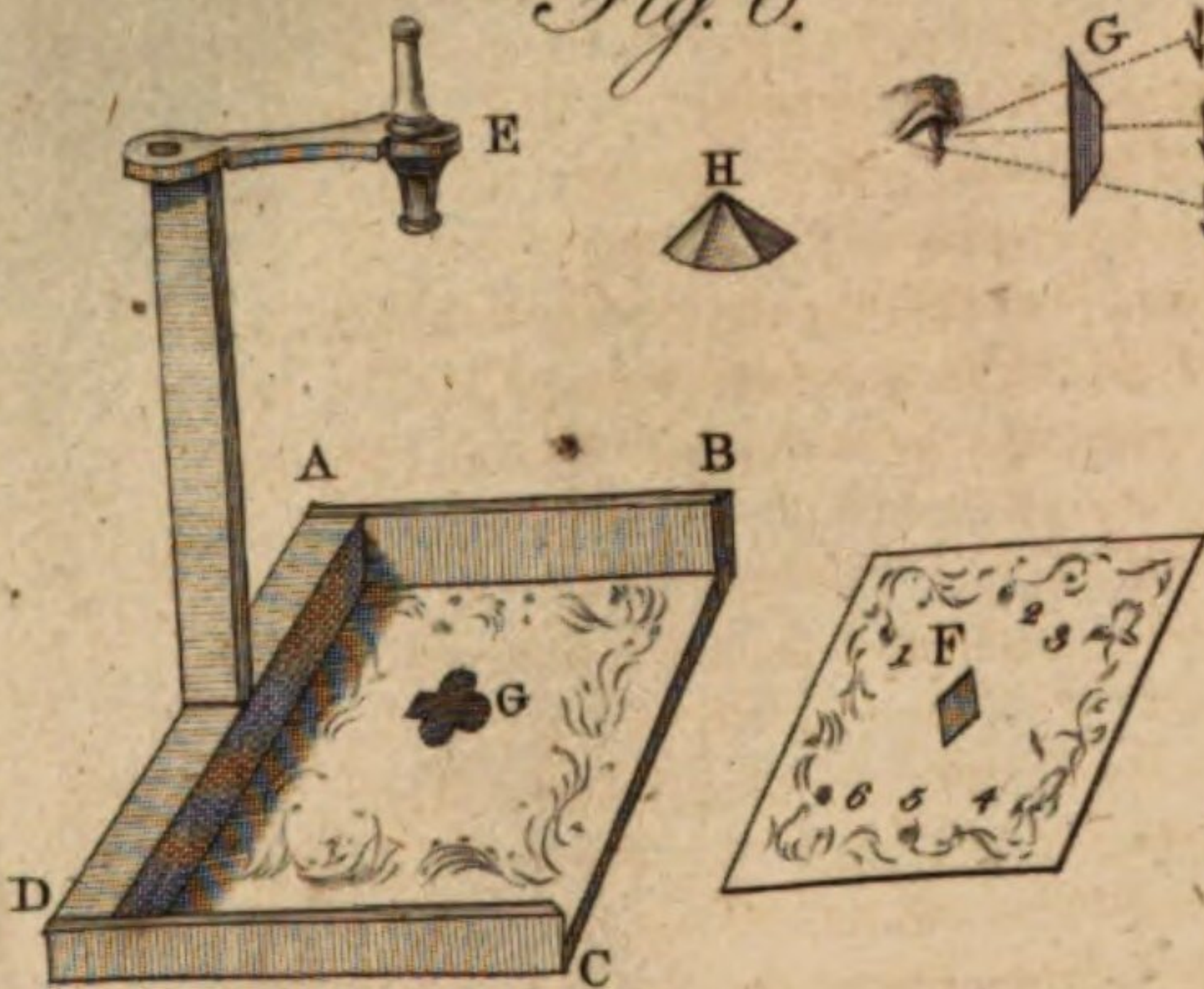


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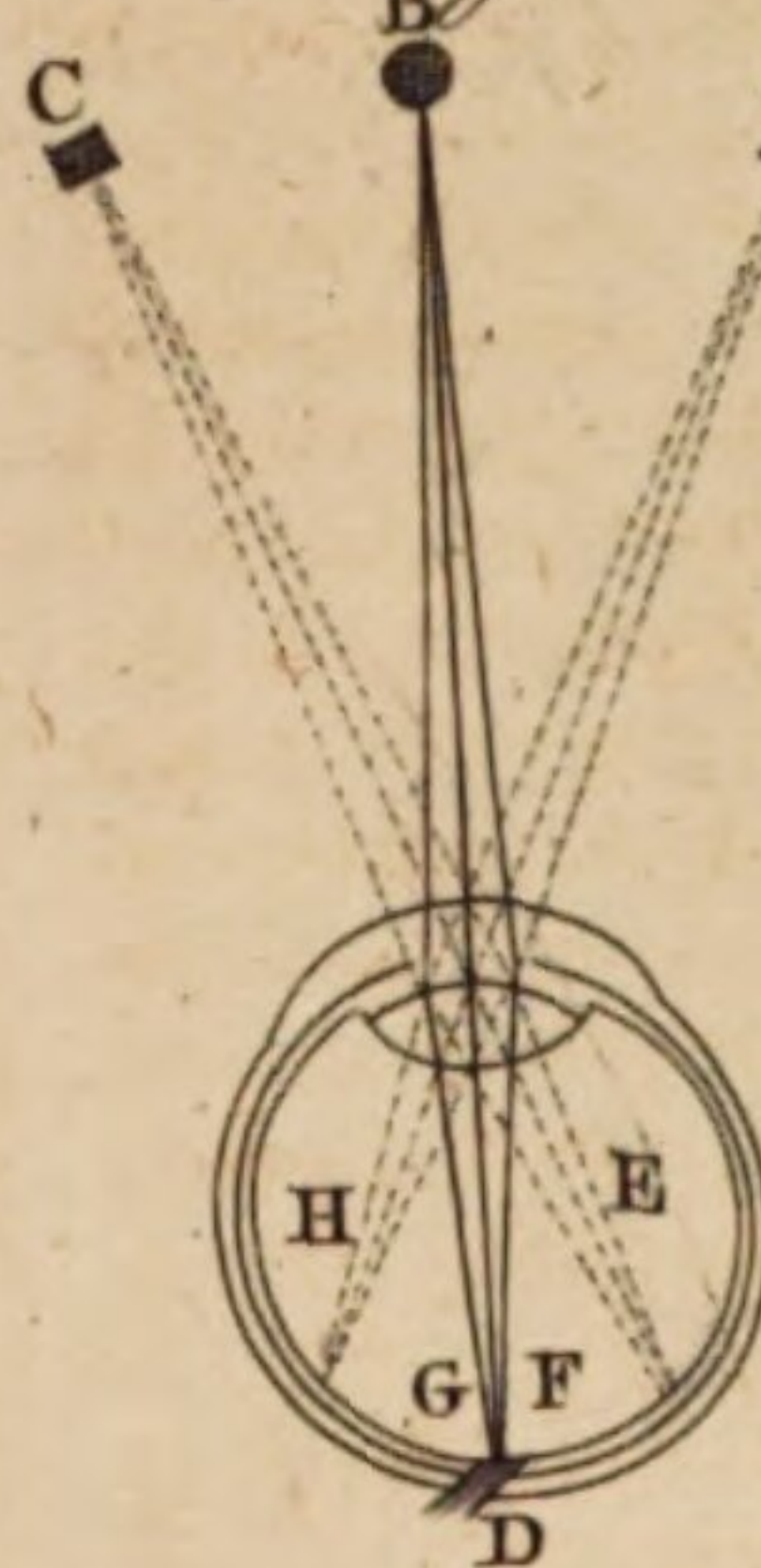


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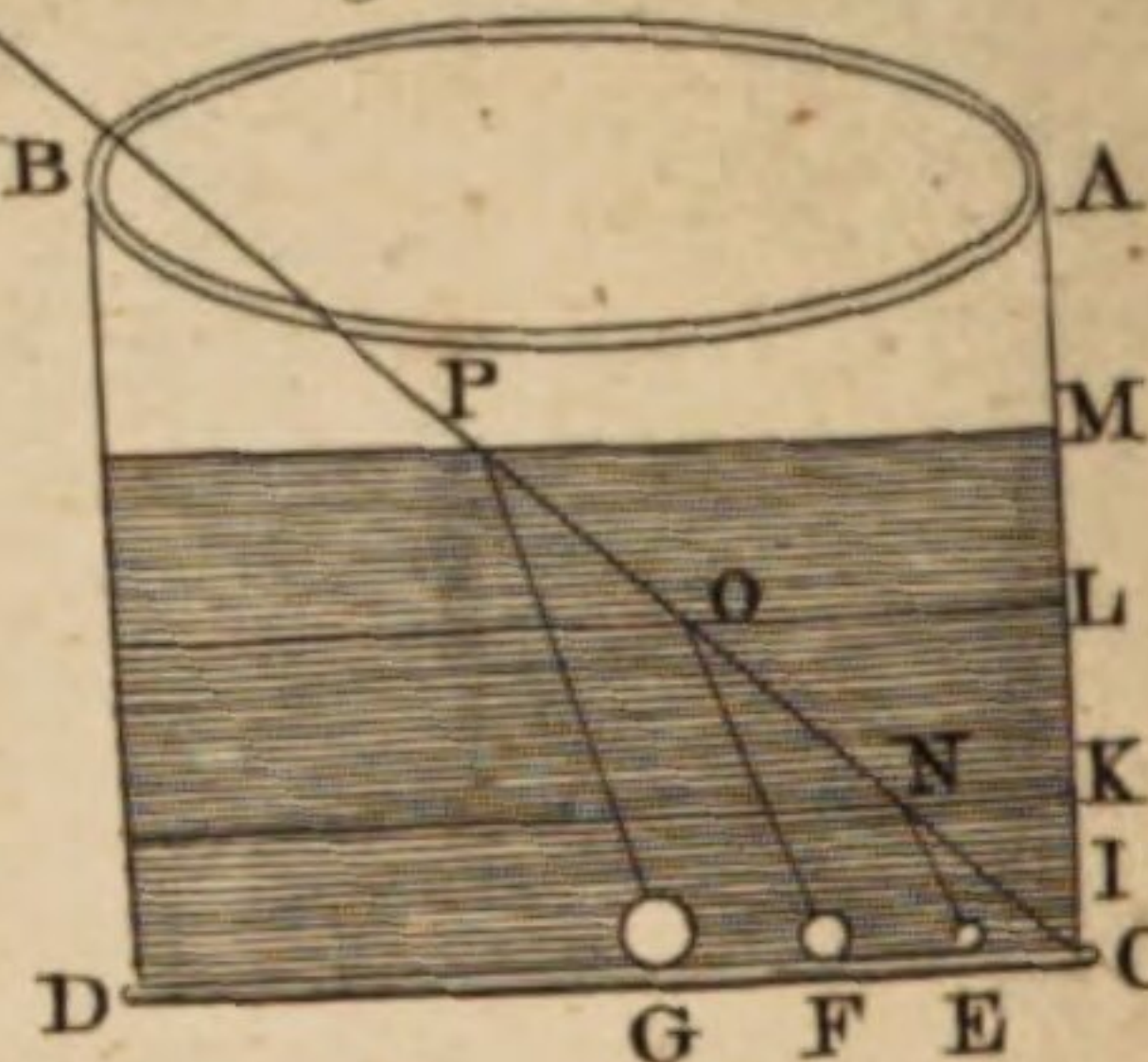


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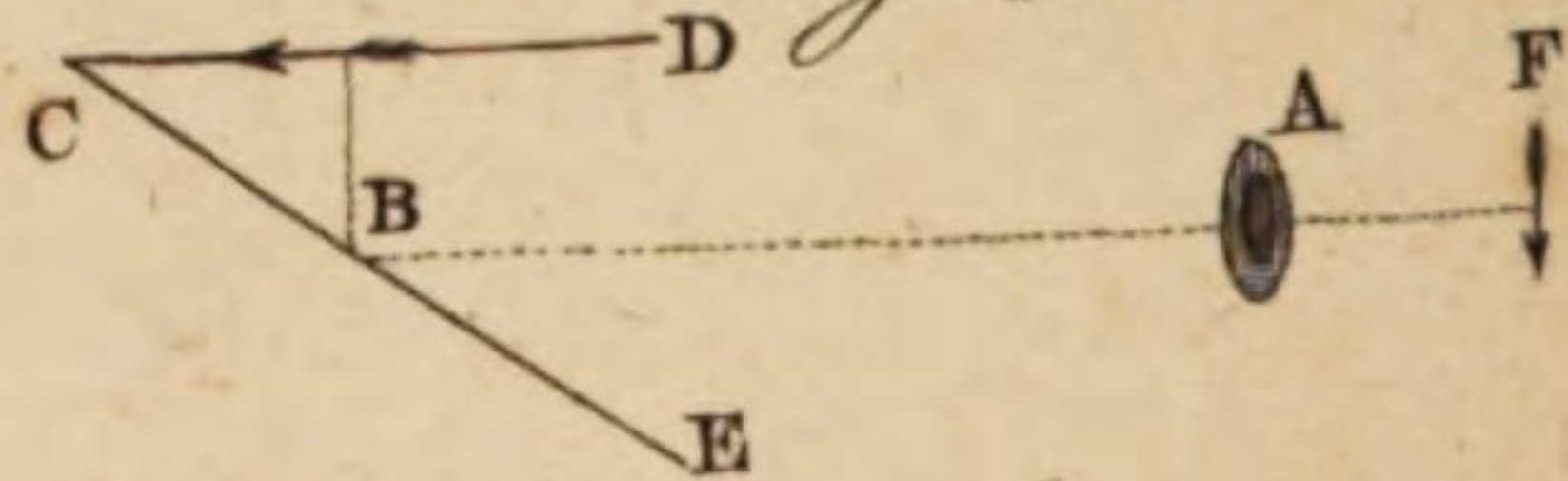


Fig. 10.

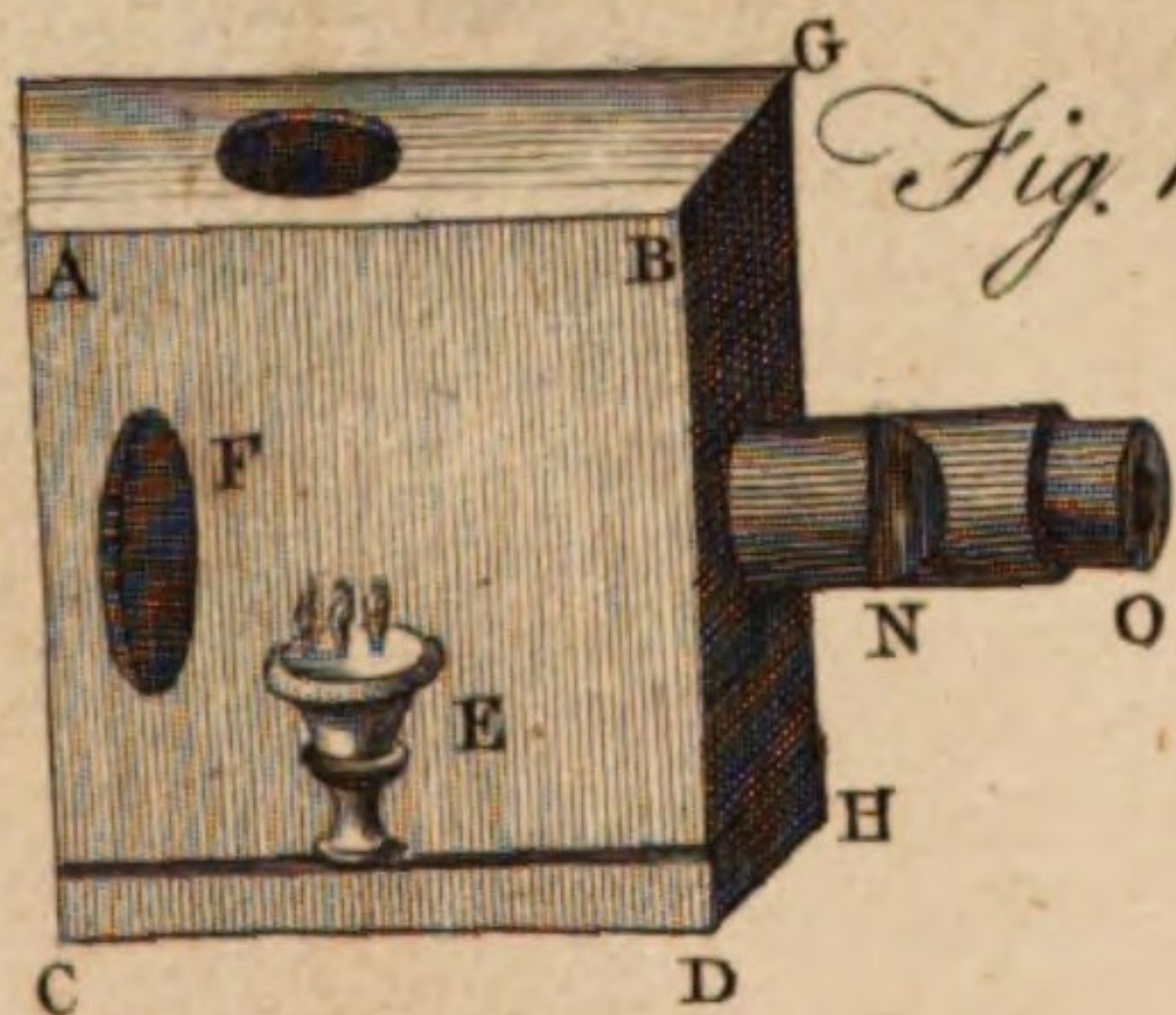


Fig. 7.

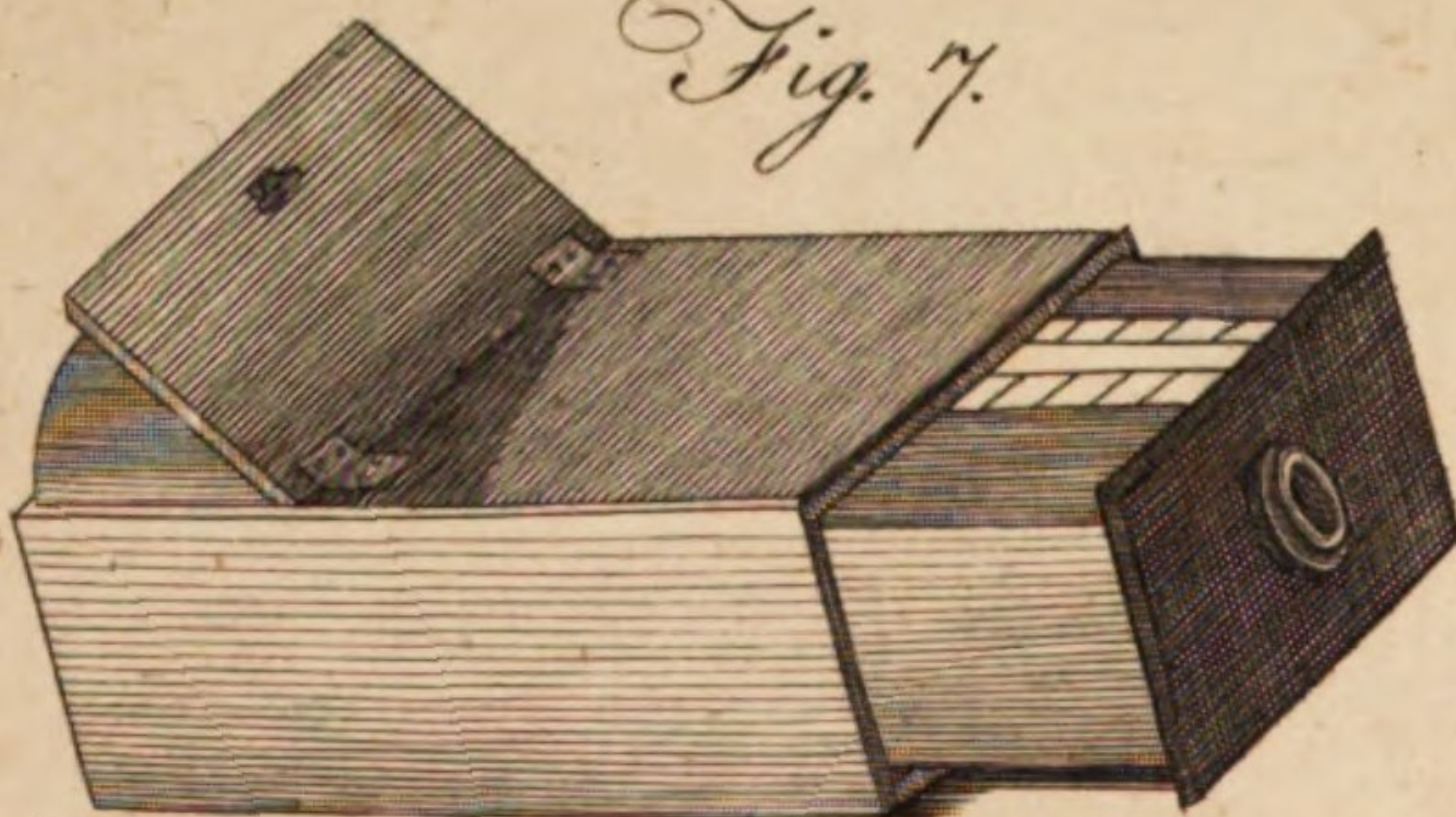


Fig. 9.

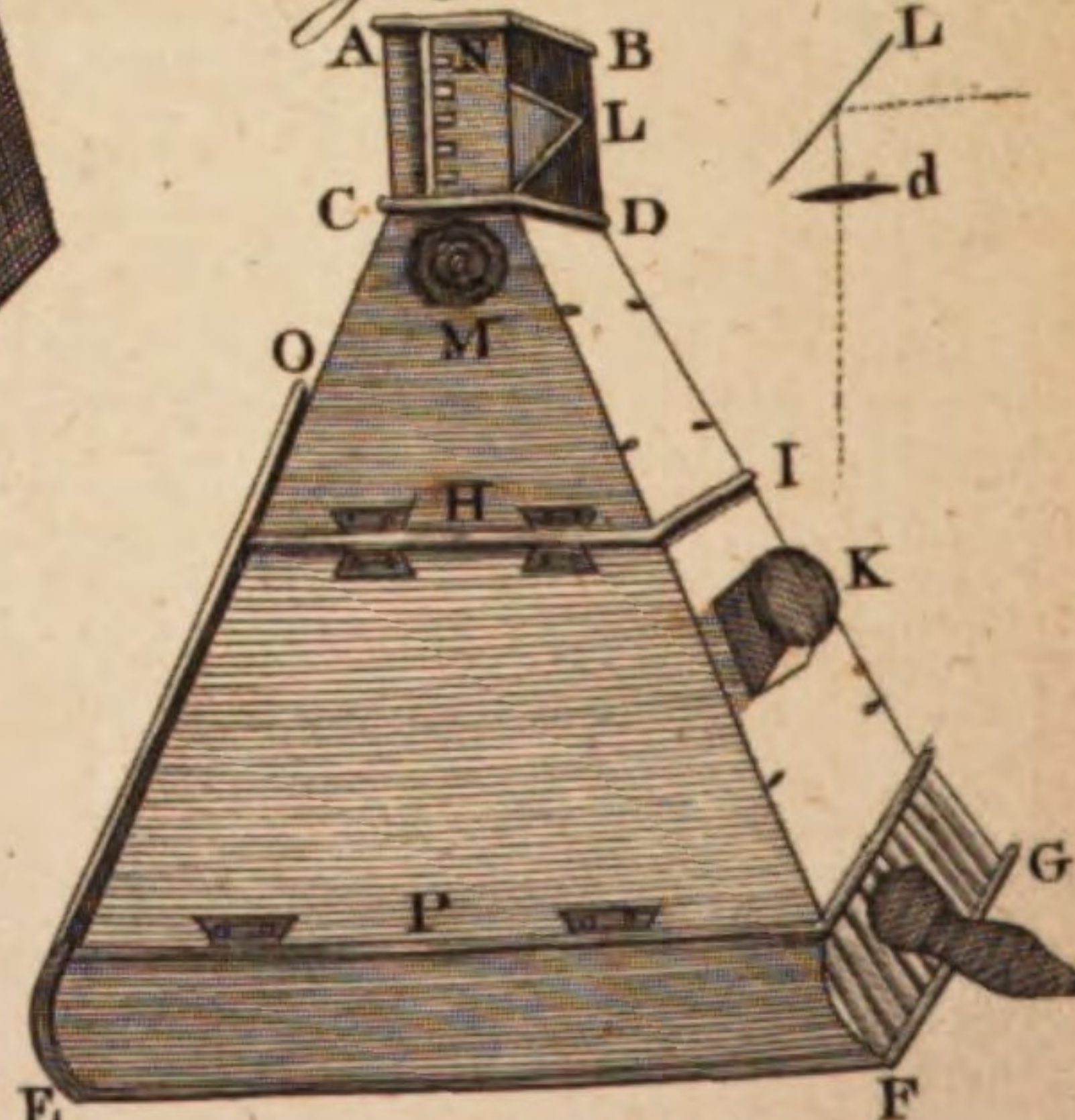


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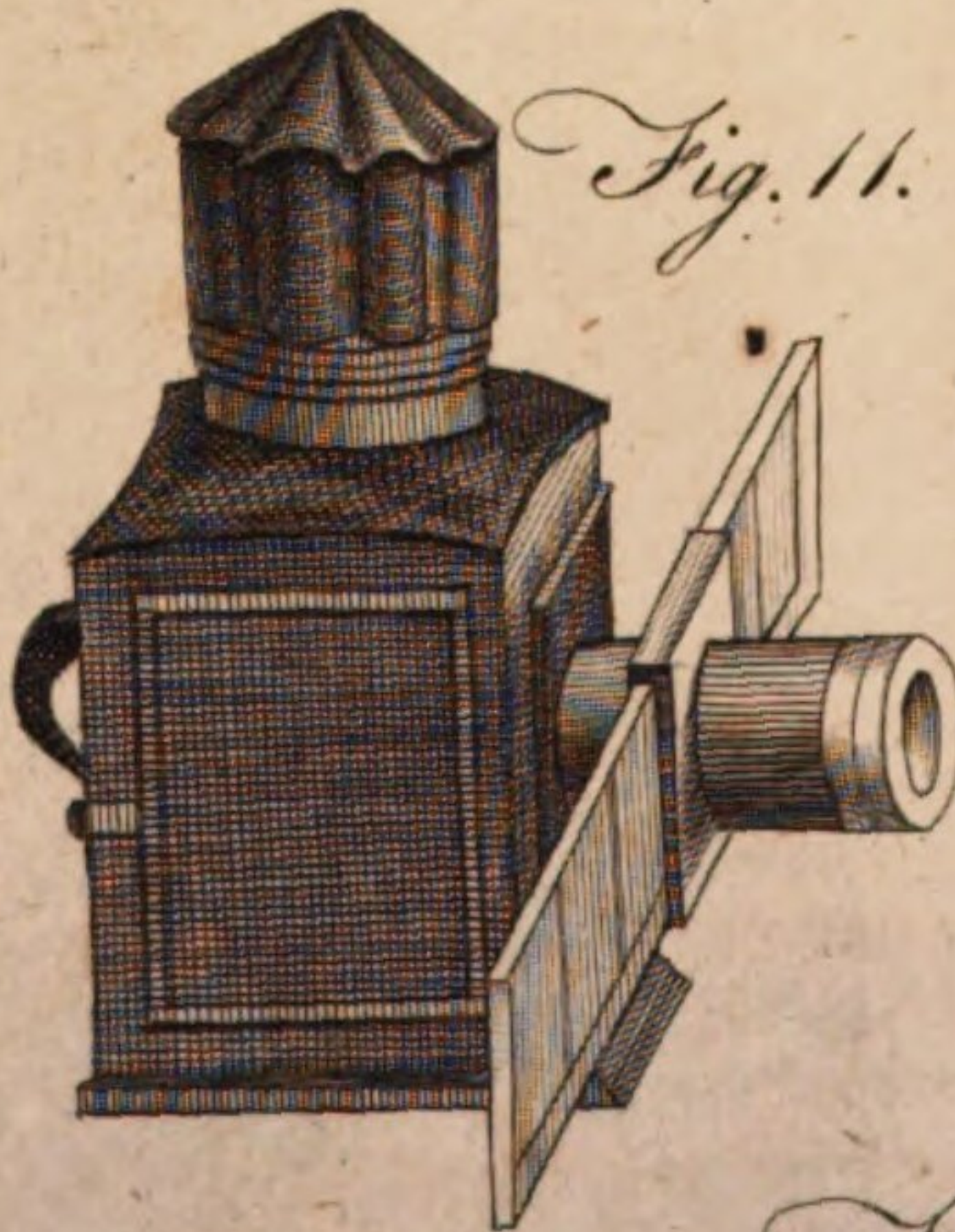


Fig. 14.



Fig. 16.

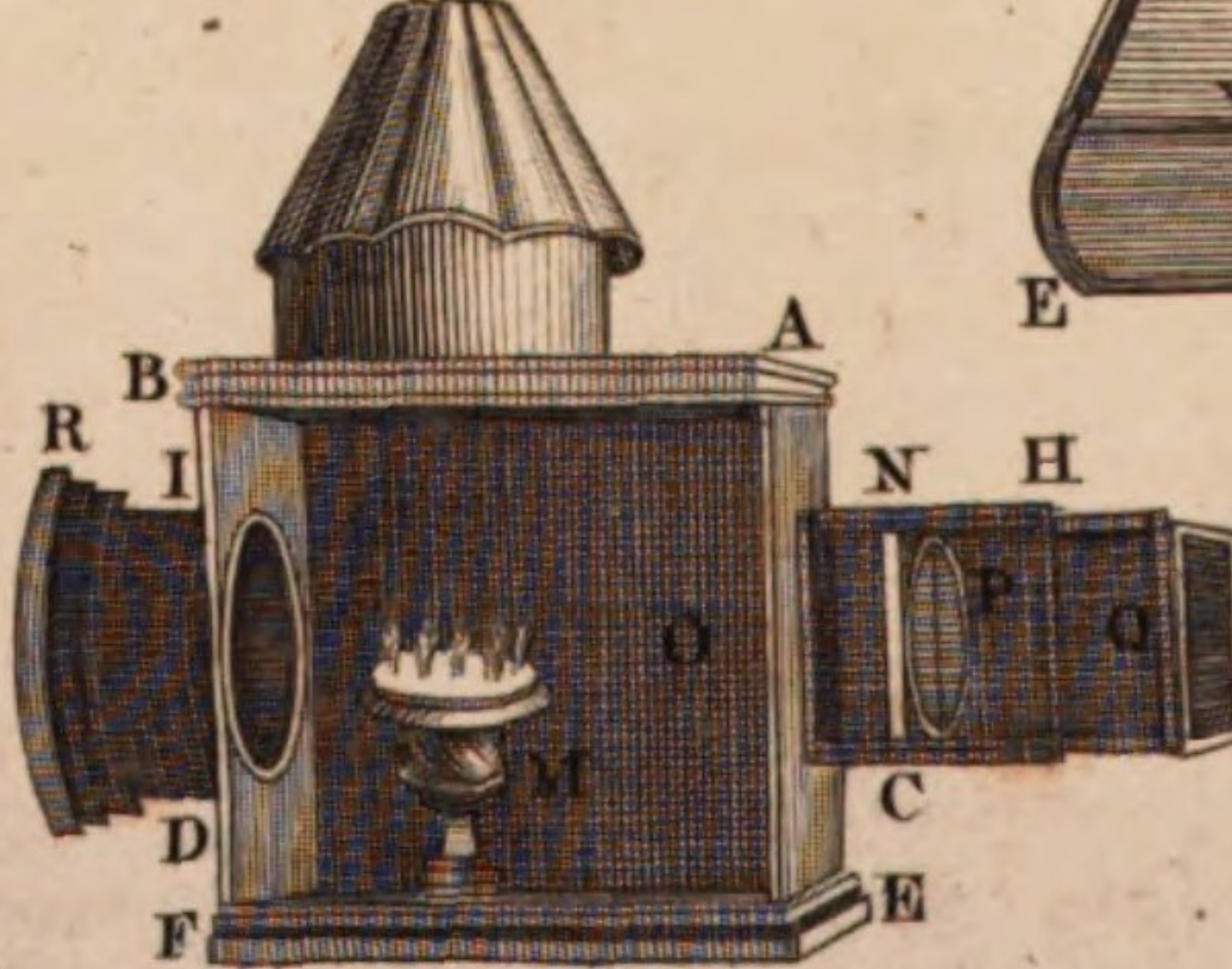


Fig. 3.

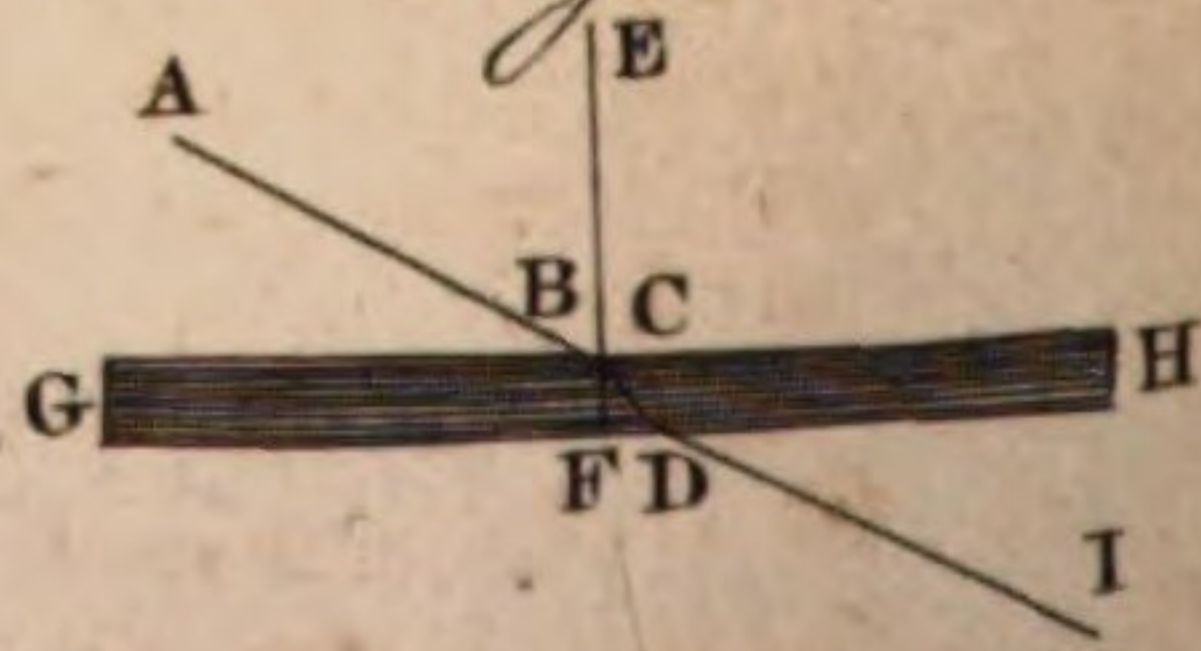


Fig. 12.



Fig. 13.



Fig. 15.



Dionysius, Oxford, in 1704, in Greek and Latin, by Dr Hudson.

DIONYSIUS, a learned geographer, to whom is attributed a *Periegesis*, or Survey of the Earth, in Greek verse. Some suppose that he lived in the time of Augustus; but Scaliger and Saumaisius place him under the reign of Severus, or Marcus Aurelius. He wrote many other works, but his *Periegesis* is the only one we have remaining; the best and most useful edition of which is that improved with notes and illustrations by Hill.

DIONYSIUS (*Areopagita*), was born at Athens, and educated there. He went afterwards to Heliopolis in Egypt; where, if we may believe some writers of his life, he saw that wonderful eclipse which happened at our Saviour's passion, and was urged by some extraordinary impulse to cry out, *Aut Deus patitur, aut cum patiente dolet*; "either God himself suffers, or condescends with him who does." At his return to Athens he was elected into the court of Areopagus, from whence he derived his name of *Areopagite*. About the year 50 he embraced Christianity; and, as some say, was appointed first bishop of Athens by St Paul. Of his conversion we have an account in the 17th chapter of the Acts of the Apostles.—He is supposed to have suffered martyrdom; but whether under Domitian, Trajan, or Adrian, is not certain. We have nothing remaining under his name, but what there is the greatest reason to believe spurious.

DIONYSIUS (the Lesser), a Scythian, became abbot of a monastery at Rome: he was the first who computed time from the birth of Dionysius to Christ, and fixed that great event, according to the vulgar æra. He was also a learned canon-law writer, and died about the year 540.

DIOPHANTINE PROBLEMS, in mathematics, certain questions relating to square and cube numbers,

and right-angled triangles, &c. the nature of which was determined by Diophantus, a mathematician of Alexandria, who is believed to have lived about the third century. We have his works, which were published with notes at Paris, in 1621, by Bachet de Méziriac; and another edition in 1670, with observations on every question, by M. Fermat.

In these questions it is endeavoured to find commensurable numbers to answer indeterminate problems; which bring out an infinite number of incommensurable quantities. For example, it is proposed to find a right-angled triangle, whose sides x, y, z , are expressed by commensurable numbers; it is known that $x^2 + y^2 = z^2$, z being the supposed hypotenuse. But it is possible to assume x and y so, that z will be incommensurable; for if $x = 1$, and $y = 2$, $z = \sqrt{5}$.

The art of resolving such problems consists in so managing the unknown quantity or quantities in such a manner, that the square or higher power may vanish out of the equation, and then by means of the unknown quantity in its first dimension, the equation may be resolved without having recourse to incommensurables; *e. gr.* let it be supposed to find x, y, z , the sides of a right-angled triangle, such as will give $x^2 + y^2 = z^2$. Suppose $z = x + u$, then $x^2 + y^2 = x^2 + 2xu + u^2$; out of which equation x^2 vanishes, and $x = \frac{y^2 - u^2}{2u}$: then assuming y and u equal to any numbers at pleasure, the sides of the triangle will be $y, \frac{y^2 - u^2}{2u}$, and the hypo-

nuse $x + u = \frac{y^2 + u^2}{2u}$; if $y = 3$, and $u = 1$, then $\frac{y^2 - u^2}{2u} = 4$, and $x + u = 5$. It is evident that this problem admits of an infinite number of solutions.

For the resolution of such kind of problems, see Saunderson's Algebra, vol. ii. book 6.

D I O P T R I C S,

THAT part of Optics which treats of the laws of refraction, and the effects which the refraction of light has in vision. The word is originally Greek, formed of *δια* *per*, "through," and *οπτική* *I see*.

As this and the other branches of Optics are fully treated under the collective name, we shall here, 1. Just give a summary of the general principles of the branch, in a few plain aphorisms, with some preliminary definitions; and, 2. Present our readers with a set of entertaining experiments illustrative of, or dependent upon, those principles.

DEFINITIONS.

1. When a ray of light passing out of one medium into another of a different density, is turned from that straight line in which it would otherwise proceed into one of a different direction, it is said to be refracted. Thus the rays AB, AC, &c. by passing out of air into the glass BGC, are turned from their natural course into that of BF, CF, &c. and are therefore said to be refracted by the lens BGC.

2. Any spherical transparent glass, that converges

or diverges the rays of light as they pass through it, is called a *lens*.

3. Of lenses there are five sorts: 1. A plane or single convex lens, which is plane on one side and convex on the other; as AZ, fig. 3. 2. A double convex lens, as B. 3. A plano-concave lens, that is, plane on one side and concave on the other, as C. 4. A double concave, as D. And, 5. A meniscus, which is convex on one side and concave on the other, as E.

4. The point C, round which the spherical surface of a lens, as AZ, is described, is called its *centre*; the line XY, drawn from that centre perpendicular to its two surfaces, is the *axis*; and the point V, to which the axis is drawn, is the *vertex* of that lens.

5. When the rays of light that pass through a single or double convex lens are brought into their smallest compass, that point is the *focus* of the lens.

6. In optical instruments, that lens which is next the object is called the *object-glass*; and that next the eye, the *eye-glass*.

7. The distance between the line AB and the perpendicular EF, is called the *angle of incidence*; and the distance between the line BD and the perpendicular EF, is called the *angle of refraction*.

E

APHO.

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Fig. 3.

A P H O R I S M S.

1. A ray of light passing obliquely out of one medium into another that is denser, will be refracted toward the perpendicular; as the ray AB, by passing out of air into glass, is refracted into BF, inclined to the perpendicular AF. On the contrary, a ray passing out of a denser into a rarer medium, will be refracted from the perpendicular; as the ray BC, passing out of the glass GH into air, is refracted into DI.

2. The sines of the angles of incidence and refraction, when the lines that contain them are all equal, will have a determinate proportion to each other, in the same mediums: which between air and water will be as 4 to 3; between air and glass, as 3 to 2, nearly; and in other mediums in proportion to their densities.

3. Any object viewed through a glass, whose two surfaces are parallel, will appear of its natural shape and dimensions, provided it be only of the size of the pupil of the eye, and the light proceeding from it be received directly through the glass by one eye only. In all other situations an alteration will be perceived not only in its apparent situation, but its dimensions also. This alteration will be greater in proportion to the thickness of the glass, and the obliquity of the rays; in general, it is so small as to be overlooked.

4. All the rays of light which fall upon a convex lens, whether parallel, converging, or diverging to a certain degree, will be made to meet in a focus on the other side; but if they diverge excessively, they will not do so. Thus if rays diverge from a point placed before the glass, at the focal distance from it, they will become parallel after passing through it; and if the point from which they proceed be nearer the glass than its focal distance, they will still continue to diverge, though in a less degree than before.

5. When parallel rays fall upon a concave lens, they will be made to diverge after passing through it. If they are diverging already before they fall upon the glass, they will diverge more after passing through it; or even if they are converging to a certain degree, they will diverge upon passing through a concave lens; but if the convergence is very great, they will converge after passing through the glass, though to a more distant point than that at which they would otherwise have met.

6. When an object is viewed through two convex lenses, its apparent diameter ought to be to its real one as the distance of the focus of the object-glass is to that of the eye-glass; but by reason of the aberration of the rays of light, the magnifying power will be somewhat greater or less in proportion to the diameter of the object.

By these aphorisms we are enabled to account for the various effects of dioptric machines, as refracting telescopes, microscopes, the camera obscura, &c. See OPTICS.

ENTERTAINING EXPERIMENTS.

I. Optical illusions.

Fig. 4. ON the bottom of the vessel ABCD, place three pieces of money, as a shilling, a half-crown, and

crown; the first at E, the second at F, and the last at G. Then place a person at H, where he can see no further into the vessel than I: and tell him, that by pouring water into the vessel you will make him see three different pieces of money; bidding him observe carefully whether any money goes in with the water.

Here you must observe to pour in the water very gently, or contrive to fix the pieces, that they may not move out of their places by its agitation.

When the water comes up to K, the piece at E will become visible; when it comes up to L, the pieces at E and F will appear; and when it rises to M, all the three pieces will be visible.

From what has been said of the refraction of light, the cause of this phenomenon will be evident: for while the vessel is empty, the ray HI will naturally proceed in a straight line: but in proportion as it becomes immersed in water, it will be necessarily refracted into the several directions NE, OF, PG, and consequently the several pieces must become visible.

II. Optical Augmentation.

Take a large drinking glass of a conical figure, that is small at bottom and wide at top; in which put a shilling, and fill the glass about half full with water: then place a plate on the top of it, and turn it quickly over, that the water may not get out. You will then see on the plate, a piece of the size of a half crown; and somewhat higher up, another piece of the size of a shilling.

This phenomenon arises from seeing the piece thro' the conical surface of the water at the side of the glass, and through the flat surface at the top of the water, at the same time: for the conical surface dilates the rays, and makes the piece appear larger; but by the flat surface the rays are only refracted, by which the piece is seen higher up in the glass, but still of its natural size. That this is the cause will be further evident by filling the glass with water; for as the shilling cannot be then seen from the top, the large piece only will be visible.

III. Optical Subtraction.

Fig. 5. AGAINST the wainscot of a room fix three small pieces of paper, as A, B, C, at the height of your eye; and placing yourself directly before them, shut your right eye and look at them with the left; when you will see only two of those papers, suppose A and B; but altering the position of your eye, you will then see the third and one of the first, suppose A; and by altering your position a second time, you will see B and C; but never all three of them together.

The cause of this phenomenon is, that one of the three pencils of rays that come from these objects, falls constantly on the optic nerve at D; whereas to produce distinct vision, it is necessary that the rays of light fall on some part of the retina E, F, G, H. We see by this experiment, one of the uses of having two eyes; for he that has one only, can never see three objects placed in this position, nor all the parts of one object of the same extent, without altering the situation of his eye.

IV. Alternate Illusion.

With a convex lens of about an inch focus, look at-

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Plate
CLXII.

attentively at a silver seal, on which a cipher is engraved. It will at first appear cut in, as to the naked eye; but if you continue to observe it some time, without changing your situation, it will seem to be in relief, and the lights and shades will appear the same as they did before. If you regard it with the same attention still longer, it will again appear to be engraved: and so on alternately.

If you look off the seal for a few moments, when you view it again, instead of seeing it, as at first, engraved, it will appear in relief. If, while you are turned toward the light, you suddenly incline the seal, while you continue to regard it, those parts that seemed to be engraved will immediately appear in relief: and if, when you are regarding these seeming prominent parts, you turn yourself so that the light may fall on the right hand, you will see the shadows on the same side from whence the light comes, which will appear not a little extraordinary. In like manner the shadows will appear on the left, if the light fall on that side. If, instead of a seal, you look at a piece of money, these alterations will not be visible, in whatever situation you place yourself.

It has been suspected that this illusion arises from the situation of the light: and in fact, "I have observed (says M. Guyot, from whom this article is taken), that when I have viewed it with a candle on the right, it has appeared engraved; but by changing the light to the left side, it has immediately appeared in relief." It still, however, remains to be explained, why we see it alternately hollow and prominent, without changing either the situation or the light. Perhaps it is in the light itself that we must look for the cause of this phenomenon; and this seems the more probable, as all these appearances are not discernible by all persons.

Mr William Jones of Holborn, has remarked to us, that this illusion is still more extraordinary and permanent, when you look at a cavity in a seal or other object through the three eye-glasses of a common four glass refracting telescope: all cavities viewed through these glasses appear constantly reliefs, in almost all situations of the light you see them with.

V. The Dioptrical Paradox.

A NEW and curious optical, or what may be called properly a *dioptrical*, deception, has been made by Mr W. Jones. Its effect is, that a print, or an ornamented drawing, with any object, such as an *ace of diamonds*, &c. in the centre F, will be seen as the *ace of clubs* when it is placed in the machine ABDC, and viewed

through a single glass only contained in the tube E. The construction of this machine is truly simple. The glass in the tube F, which brings about this surprising change, is somewhat on the principle of the common multiplying glass, as represented at G, which by the number of its inclined surfaces, and from the refractive power of the rays proceeding from the objects placed before it, shows it in a multiplied state or quantity. Its only difference is, that the sides of this glass are flat, and diverge upwards from the base to a point in the axis of the glass like a cone: the number of the sides is six; and each side, from its angular position to the eye, has the property of refracting from the border of the print F such a portion of it (designedly there placed), as will make a part in the composition of the figure to be represented: for the hexagonal and conical figure of this glass prevents any sight of the ace of diamonds in the centre being seen; consequently the ace of clubs being previously and mechanically drawn in the circle of refraction in six different parts of the border, at 1, 2, 3, 4, 5, 6, and artfully disguised in the ornamental border by blending them with it, the glass in the tube at E will change the appearance of the ace of diamonds F into the ace of clubs G. In the same manner may other prints undergo similar changes, according to the will of an ingenious draughtsman who may design them. The figure of the glass is clearly shown at H.

VI. The Camera Obscura, or Dark Chamber.

MAKE a circular hole in the shutter of a window, from whence there is a prospect of the fields, or any other object not too near; and in this hole place a convex glass, either double or single, whose focus is at the distance of five or six feet (A). Take care that no light enter the room but by this glass: at a distance from it, equal to that of its focus, place a pasteboard, covered with the whitest paper; which should have a black border, to prevent any of the side rays from disturbing the picture. Let it be two feet and a half long, and 18 or 20 inches high: bend the length of it inwards, to the form of part of a circle, whose diameter is equal to double the focal distance of the glass. Then fix it on a frame of the same figure, and put it on a moveable foot, that it may be easily fixed at that exact distance from the glass where the objects paint themselves to the greatest perfection. When it is thus placed, all the objects that are in the front of the window will be painted on the paper, in an inverted position (B), with the greatest regularity and in the most natural colours.

E 2

If

Fig. 6.

(A) The distance should not be less than three feet; for if it be, the images will be too small, and there will not be sufficient room for the spectators to stand conveniently. On the other hand, the focus should never be more than 15 or 20 feet, for then the images will be obscure, and the colouring faint. The best distance is from 6 to 12 feet.

(B) This inverted position of the images may be deemed an imperfection, but it is easily remedied: for if you stand above the board on which they are received, and look down on it, they will appear in their natural position: or if you stand before it, and, placing a common mirror against your breast in an oblique direction, look down in it, you will there see the images erect, and they will receive an additional lustre from the reflection of the glass; or place two lenses, in a tube that draws out; or, lastly, if you place a large concave mirror at a proper distance before the picture, it will appear before the mirror, in the air, and in an erect position.

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If you place a moveable mirror without the window; by turning it more or less, you will have on the paper all the objects that are on each side of the window (c).

If instead of placing the mirror without the window you place it in the room, and above the hole (which must then be made near the top of the shutter), you may receive the representation on a paper placed horizontally on a table; and draw, at your leisure, all the objects that are there painted.

Nothing can be more pleasing than this experiment, especially when the objects are strongly enlightened by the sun: and not only land-prospects, but a sea-port, when the water is somewhat agitated, or at the setting of the sun, presents a very delightful appearance.

This representation affords the most perfect model for painters, as well for the tone of colours, as that degradation of shades, occasioned by the interposition of the air, which has been so justly expressed by some modern painters.

It is necessary that the paper have a circular form; for otherwise, when the centre of it was in the focus of the glass, the two sides would be beyond it, and consequently the images would be confused. If the frame were contrived of a spherical figure, and the glass were in its centre, the representation would be still more accurate. If the object without be at the distance of twice the focal length of the glass, the image in the room will be of the same magnitude with the object.

The lights, shades, and colours, in the camera obscura, appear not only just, but, by the images being reduced to a smaller compass, much stronger than in nature. Add to this, that these pictures exceed all others, by representing the motion of the several objects: thus we see the animals walk, run, or fly; the clouds float in the air; the leaves quiver; the waves roll, &c.; and all in strict conformity to the laws of nature. The best situation for a dark chamber is directly north, and the best time of the day is noon.

VII. *To show the Spots on the Sun's Disk, by its Image in the Camera Obscura.*

Put the object glass of a 10 or 12 feet telescope into the scioptric ball, and turn it about till it be directly opposite to the sun (D). Then place the pasteboard, mentioned in the last experiment, in the focus of the lens; and you will see a clear bright image of the sun, of about an inch diameter, in which the spots on the sun's surface will be exactly described.

As this image is too bright to be seen with pleasure by the naked eye, you may view it through a lens whose focus is at six or eight inches distance; which at the same time that it prevents the light from being offen-

sive, will, by magnifying both the image and the spots, make them appear to greater advantage.

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VIII. *To magnify small Objects by means of the Sun's Rays let into a Dark Chamber.*

LET the rays of light that pass through the lens in the shutter be thrown on a large concave mirror, properly fixed in a frame. Then take a slip or thin plate of glass; and sticking any small object on it, hold it in the incident rays, at a little more than the focal distance from the mirror; and you will see, on the opposite wall, amidst the reflected rays, the image of that object, very large, and extremely clear and bright. This experiment never fails to give the spectator the highest satisfaction.

IX. *The Portable Camera Obscura.*

THE great pleasure produced by the camera obscura in the common form, has excited several to render it more universally useful by making it portable; easily fixed on any spot, and adapted to every prospect. We shall not here examine the merits of the various sorts that have been invented; but content ourselves with describing two of late improved constructions, as made and sold by the opticians of the present time, and that appear in their construction the most convenient and advantageous of any yet contrived.

The pocket or portable camera obscura, with a drawer to draw out in the front, is represented in fig. 7. Fig. 7. The images of the objects before the instrument are reflected upon a glass ground rough on its upper side, and that is placed at top of the hinder part of the box, under the moveable cover represented in the figure. The images represented thereon will afford a most beautiful and perfect piece of perspective or landscape of whatever is before the camera, and more particularly so if the sun shines upon the objects. The outlines of them may easily be traced on the glass by a black-lead pencil. There is sometimes a scale of proportions placed in the upper surface of the drawer, by which any particular building or other object may be drawn in a given proportion or magnitude, and according to the figures inserted on the scale, which are adapted to the focus or foci of the lenses made use of in the camera. The glasses that are made use of in this camera are only three, and are represented in fig. 8. Fig. 8. The convex glass A is placed in the front of the drawer of the camera, and is of a focus agreeable to the length of the box. The mirror CE reclines in the box in an angle of 45 degrees from a perpendicular situation. The rays flowing from the object F through the convex glass A to the plane mirror CE, will be reflected from it, and meet in points on the glass placed horizontally

(c) There is another method of making the dark chamber; which is by a scioptric ball, that is, a ball of wood, through which a hole is made, in which hole a lens is fixed: this ball is placed in a wooden frame, in which it turns freely round. The frame is fixed to the hole in the shutter; and the ball, by turning about, answers, in great part, the use of the mirror on the outside of the window. If the hole in the window be no bigger than a pea, the objects will be represented without any lens, though by no means so distinctly, or with such vivid colours.

(D) When the sun is directly opposite to the hole, the lens will itself be sufficient: or by means of the mirror on the outside of the window, as in Experiment VI. the lens will answer the purpose at any time.

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zontally in the direction CD, and will form thereon the aforementioned images. If on this glass an oiled paper or any other transparent substance be placed, the images will be clearly represented, and sufficiently so to delineate them by a black-lead pencil or crayon. Instead of the glass CD, or sometimes underneath it, is often placed a double convex lens of a focus somewhat shorter than the length of the box: this alteration considerably brightens the appearance of the images, and renders them as vivid as the objects themselves, though not quite so accurate in their contours or outlines as by the preceding method.

Fig. 9.

Another kind of portable camera obscura is, where the images are formed upon white paper, and the several parts of the camera fold up out of a box shaped like a book or chest. This way of the images being formed on paper is a much preferable one to the preceding method, and admits of their being traced on the paper with the utmost readiness. This instrument, as open out of its case and ready for use, is represented in fig. 9. The front and sides fold up to the height of about two feet from the case EFG, by means of hinges placed at P, H, &c. The head ABCD, about five inches square and high, containing the mirror L and the convex lens beneath it, fits on at CD, and the inner square tube of it is moved up and down by rack-work and a pinion NM. This motion serves to adjust the convex lens *d* to its proper focal distance from the white paper placed within side at the bottom of the box EFG, so that the images may be formed with the greatest possible distinctness. In tracing these images the face is applied close to the hole in the front at K, and the hand in the sleeve in the front at the bottom of FG. When the sides and front are unhooked and folded down, they all lie close in the box EFG, and the lid O folds down as a top on them close, and the box remains then the size of a common folio book, and is covered with calf leather and lettered on the back in perfect imitation of one.

By the diagonal position of a plane mirror the curious opera-glass is constructed, by which any person may be viewed in a theatre or public company, and yet know nothing of it. It consists only in placing a concave glass near the plane mirror, in the end of a short round tube, and a convex glass in a hole in the side of the tube. Then holding the end of the tube with the glass to the eye, all objects next to the hole in the side will be reflected so as to appear in a direct line forward, or in a position at right angles to the person's situation who is looked at. Plane glasses instead of a concave and convex may be used; but in this case there will be no magnitude of the object, but it will appear brighter. It is called by opticians the *diagonal opera-glass*.

X. The Magic Lantern.

THIS very remarkable machine, which is now known over all the world, caused great astonishment at its origin. It is still beheld with pleasing admiration; and the spectator very frequently contents himself with wondering at its effects, without endeavouring to investigate their cause. The invention of this ingenious illusion is attributed to the celebrated P. Kercher, who has published on various sciences, works equally learned, curious, and entertaining. Its design is to repre-

sent at large, on a cloth or board, placed in the dark, the images of small objects, painted with transparent colours on plates of glass.

The construction is as follows. Let ABCD be the side of a tin box, eight inches high, eight inches long, and ten broad (or any other similar dimensions), the top of which must have a funnel, with a cover, as represented in fig. 11; which at the same time it gives a passage to the smoke, prevents the light from coming out of the box. In the middle of the bottom of the box must be placed a low tin lamp E, which is to be moveable. It should have three or four lights, that must be at the height of the centre of the glasses in the tubes N and O. In the largest of these tubes must be placed a glass semiglobular lens N, about four inches diameter; and in the smaller one a double convex lens O, about $2\frac{1}{2}$ inches diameter, and six inches focus, the length of the tubes holding them about $4\frac{1}{2}$ inches each; the inner tube containing the small lens O must be a sliding one, in order to adjust it at a proper distance from the painted sliders, so that the objects thereon may be distinctly represented on the cloth or white wall. A slit or opening between the glass N and the front side BGDH of the box must be made large enough to admit the sliders to be passed through, (as in fig. 11.) The clearness of the light, and the objects upon the cloth, will depend much upon the light of the lamp: it will therefore be proved best, to place, instead of the common lamp E, a kind of the new or Argant's Patent Lamp, which will be found considerably to improve the effect of the lantern by its superior strength of light.

From the construction of this lantern it is evident, that when the glass sliders, with the painted figures, are placed in the groove or slit in the lantern for that purpose, and the room darkened, a quantity of light from the lamp at E will be collected by the lens N, and refracted upon the cloth placed opposite; and that by moving the sliding tube containing the small lens O gradually in or out as occasion may require, this lens will form images of the figures on the sliders in their distinct colours and proportions, with the appearance of life itself, and of any size from six inches to 7 feet, according to the distance of the lantern from the cloth. The lantern, with one of the sliders ready for use, is clearly represented in fig. 11. By the aid of the new patent lamp aforementioned, considerable useful improvements are made to this lantern. Mr Jones optician of Holborn has contrived an apparatus to be applied to it, that converts it into a microscope by night; and it shows all the variety of transparent and many of the opaque objects magnified upon a cloth or screen opposite, similar to the figures above mentioned, but not in so large a degree; about one or two feet diameter is the utmost that can at present be obtained.

Method of Painting the Glasses for the Lantern. Draw on a paper the subject you desire to paint, and fix it at each end to the glass. Provide a varnish with which you have mixed some black paint; and with a fine pencil draw on the other side of the glass, with very light touches, the design drawn on the paper. If you are desirous of making the painting as perfect as possible, you should draw some of the outlines in their proper

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proper colours, provided they are the strongest tints of these colours that are used. When the outlines are dry, you colour the figures with their proper tints or degradations. Transparent colours are most proper for this purpose, such as carmine, lake, Prussian blue, verdigris, &c. and these must be tempered with a strong white varnish, to prevent their peeling off. You are then to shade them with black mixed with the same varnish, or with bistre, as you find convenient. You may also leave strong lights in some parts, without any colours, in order to produce a more striking effect. Observe, in particular, not to use more than four or five colours, such as blue, red, green, and yellow. You should employ, however, a great variety of tints, to give your painting a more natural air; without which they will represent vulgar objects, which are by no means the more pleasing because they are gawdy.

When the lamp in this lantern is lighted, and, by drawing out the tube to a proper length, the figures painted on the glass appear bright and well defined, the spectator cannot fail of being highly entertained by the succession of natural or grotesque figures that are painted on the glasses. This piece of optics may be rendered much more amusing, and at the same time more marvellous, by preparing figures to which different natural motions may be given (E), which every one may perform according to his own taste; either by movements in the figures themselves, or by painting the subject on two glasses, and passing them at the same time through the groove, as will be seen in the next experiment.

XI. To represent a Tempest by the Magic Lantern.

PROVIDE two plates of glass, whose frames are so thin that they may both pass freely through the slit or groove of the common magic lanterns at the same time.

On one of these glasses you are to paint the appearance of the sea, from the slightest agitation to the most violent commotion. Representing from A to B a calm; from B to C a small agitation, with some clouds; and so on to F and G, which should exhibit a furious storm. Observe, that these representations are not to be distinct, but run into each other, that they may form a natural gradation: remember also, that great part of the effect depends on the perfection of the painting, and the picturesque appearance of the design.

On the other glass you are to paint vessels of different forms and dimensions, and in different directions, together with the appearance of clouds in the tempestuous parts.

You are then to pass the glass slowly through the groove; and when you come to that part where the storm begins, you are to move the glass gently up and down, which will give it the appearance of a sea that begins to be agitated: and so increase the motion till you come to the height of the storm. At the same time you are to introduce the other glass with the ships, and moving that in like manner, you will have a natural representation of the sea, and of ships in a calm and in a storm. As you draw the glasses slowly back,

the tempest will seem to subside, the sky grow clear, and the ships glide gently over the waves.—By means of two glasses disposed in this manner you may likewise represent a battle, or sea-fight, and numberless other subjects, that every one will contrive according to his own taste. They may also be made to represent some remarkable or ludicrous action between different persons, and many other amusements that a lively imagination will easily suggest.

XII. The Nebulous Magic Lantern.

THE light of the magic lantern, and the colour of images, may not only be painted on a cloth, but also reflected by a cloud of smoke.

Provide a box of wood or pasteboard (fig. 14.) of about four feet high, and of seven or eight inches square at bottom, but diminishing as it ascends, so that its aperture at top is but six inches long, and half an inch wide. At the bottom of this box there must be a door that shuts quite close, by which you are to place in Fig. 14. the box a chafing-dish with hot coals, on which is to be thrown incense, whose smoke goes out in a cloud at the top of the box. It is on this cloud that you are to throw the light that comes out of the lantern, and which you bring into a smaller compass by drawing out the moveable tube. The common figures will here serve. It is remarkable in this representation, that the motion of the smoke does not at all change the figures; which appear so conspicuous, that the spectator thinks he can grasp them with his hand.

Note, In this experiment some of the rays passing through the smoke, the representation will be much less vivid than on the cloth; and if care be not taken to reduce the light to its smallest focus, it will be still more imperfect.

XIII. To produce the Appearance of a Phantom upon a Pedestal placed on the middle of a Table.

INCLOSE a common small magic lantern in a box A B C D, that is large enough to contain also an inclined mirror M; which must be moveable, that it may reflect the cone of light thrown on it by the lantern, in such a manner that it may pass out at the aperture made in the top of the box. There should be a flap with hinges to cover the opening, that the inside of the box may not be seen when the experiment is making. This aperture should likewise be oval, and of a size adapted to the cone of light that is to pass through it. There must be holes made in that part of the box which is over the lantern, to let out the smoke; and over that part must be placed a chafing-dish of an oblong figure, and large enough to hold several lighted coals. This chafing-dish may be inclosed in a painted tin box of about a foot high, and with an aperture at top something like fig. 14. It should stand on four short feet, to give room for the smoke of the lamp to pass out. There must also be a glass that will ascend and descend at pleasure in a vertical groove *ab*. To this glass let there be fixed a cord, that, going over a pulley

(E) There are in the Philosophical Essays of M. Muschenbroek, different methods of performing all these various movements, by some mechanical contrivances that are not difficult to execute.

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ley *c*, passes out of the box at the side *CD*, by which the glass may be drawn up, and will descend by its own weight. On this glass may be painted a spectre, or any other more pleasing figure. Observe that the figures must be contracted in drawing, as the cloud of smoke does not cut the cone of light at right angles, and therefore the figures will appear longer than they do on the glass.

After you have lighted the lamp in the lantern, and put the mirror in a proper direction, you place the box or pedestal *ABCD* on a table; and putting the chafing-dish in it, throw some incense in powder on the coals. You then open a trap-door, and let down the glass slowly; and when you perceive the smoke diminish you draw up the glass, that the figure may disappear, and shut the trap-door. This appearance will occasion no small surprise, as the spectre will seem to rise gradually out of the pedestal, and on drawing up the glass will disappear in an instant. Observe, that when you exhibit this experiment, you must put out all the lights in the room; and the box should be placed on a high table, that the spectators may not perceive the aperture by which the light comes out. Tho' we have mentioned a small magic lantern, yet the whole apparatus may be so enlarged, that the phantom may appear of a formidable size.

XIV. *The Magic Theatre.*

By making some few additions to the magic lantern with the square tube, used in Experiment X. various scenes, characters, and decorations of a theatre may be represented in a lively manner. In this experiment it is quite necessary to make the lantern much larger than common, that the objects painted on the glasses, being of a larger size, may be represented with greater precision, and consequently their several characters more strongly marked.

Fig. 16.

Let there be made a wooden box *ABCD*, a foot and a half long, 15 inches high, and 10 wide. Let it be placed on a stand *EF*, that must go round it, and by which it may be fixed with two screws to a table. Place over it a tin cover, as in the common lantern. Make an opening in its two narrowest sides; in one of which place the tube *H*, and in the other the tube *I*: let each of them be six inches wide, and five inches high: in each of these tubes place another that is moveable, in order to bring the glasses, or concave mirror, that are contained in them, to a proper distance. In the middle of the bottom of this box place a tin lamp *M*; which must be moveable in a groove, that it may be placed at a proper distance with regard to the glasses and mirror: this lamp should have five or six lights, each of them about an inch long. At the beginning of the tube *H*, toward the part *N*, make an opening of an inch wide, which must cross it laterally: another of three quarters of an inch, that must cross it vertically, and be nearer the box than the first; and a third of half an inch, that must be before the first. The opening made laterally must have three or four grooves, the second two, and the third one: that

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different subjects of figures and decorations may be passed, either sidewise, ascending or descending, so that the scenes of a theatre may be the more exactly imitated (*r*). Inclose these grooves between two convex rectangular glasses, of six inches long, and five inches high, and of about 20 inches focus; one of which must be placed at *O*, and the other toward *P*. Have another tube *Q*, of about a foot long, which must enter that marked *H*; and at its outward extremity place a lens of about 15 inches focus. There must also be a third tube *R*, four inches long, into which that marked *I* is to enter: to the exterior end of this adjust a concave mirror, whose focus must be at seven or eight inches from its reflecting surface.

The magic lantern being thus adjusted, nothing more is necessary than to provide glasses, painted with such subjects as you would represent, according to the grooves they are to enter. The lamp is then to be lighted; and placing a glass in one of the grooves, you draw out the moveable tubes till the object paints itself on a cloth to the most advantage: by which you determine the distance of the lantern and the size of the image. You then make a hole in the partition of that size, and fix in it a plate of clear glass, over which you paste a very thin paper, which must be varnished, that it may be as transparent as possible.

On this paper are to be exhibited the images of all those objects, that, by passing successively through the grooves, are to represent a theatric entertainment. The exhibition will be very agreeable; because the magic lantern being concealed behind the partition, the cause of the illusion cannot by any means be discovered.

In order to show more clearly in what manner a subject of this sort should be painted, and the glasses disposed, we will here make choice of the siege of Troy for a theatric subject; in which will be found all the incidents necessary to the exhibition of any other subject whatever.—In the first act, the theatre may represent, on one side, the ramparts of Troy; toward the back-part, the Grecian camp; and at a further distance, the sea, and the isle of Tenedos. We will suppose the time to be that when the Greeks feigned to raise the siege; and embarked, leaving behind them the wooden horse, in which were contained the Grecian soldiers.—On a glass, therefore, of the same width with the aperture made in the side *AC* of the box, you are to paint a deep blue curtain, lightly charged with ornaments, quite transparent. This glass is to be placed in the first vertical groove; so that by letting it gently down, its image may appear to rise in the same manner as the curtain of a theatre. All the glasses that are to ascend or descend must be bordered with thin pieces of wood, and so exactly fill the grooves, that they may not slide down of themselves.—You must have several glasses of a proper size to pass through the horizontal grooves, and of different lengths according to the extent of the subject. You may paint, on the first, the walls of Troy. On the second, the Grecian camp. On the third, the sea, the isle of Tenedos, and a serene sky. On the fourth, the Grecian troops.

(*r*) In the decorations, the clouds and the palaces of the gods should descend; caves and infernal palaces should ascend; earthly palaces, gardens, &c. enter at the sides.

troops by detached figures. On the fifth, other troops, disposed in battalions, and placed at a distance. On the sixth, divers vessels, which as the glass advances in the groove diminish in size. On the seventh, the wooden horse and Sinon. On the eighth, Trojan men and women.

These glasses being properly painted, you place in the horizontal grooves the first, second, third, and fourth. Then draw up the curtain, by letting down the glass on which it is painted, and draw away gently the fourth glass, and after that the second; then advance very gently the fifth, that represents the embarkment, and pass it quite through. Next pass, the opposite way, the sixth, which represents the Grecian fleet. The objects painted on the fourth, fifth, and sixth, quite disappearing, you are to advance the seventh, on which is painted the wooden horse; and at the same time the eighth, where the Trojans will appear to draw the horse into the city. The curtain is then to be let down, that you may withdraw the scenes of the first act, and place in the grooves those that are to compose the second.—In the second act may be represented the interior part of the city of Troy: on one side may be seen the wooden horse, and in the back part the temple of Pallas. The glasses for this act may be painted in the following manner. On the first may be palaces and houses, representing the inside of a city. On the second, the temple of Pallas in the centre, with a clear night and the moon. In the front may be seen the wooden horse, that the Trojans have placed near the temple of Pallas. On the third, a troop of Greeks, with Sinon at their head, who are going to open the gates of the city to the Grecians. On the fourth, different troops of armed Greeks; painted on a long glass, to afford variety. On the fifth, several troops of Trojans. On the sixth, various appearances of fire and smoke, so disposed, that, this glass being drawn up above the others, the objects painted on the first glass may appear in a conflagration.

Before you draw up the curtain, you should place the first and second glasses. You then pass the whole third glass slowly; a little after, the fourth, on which are painted the different bodies of armed Greeks; and at the same time, from the opposite side, the sixth glass, that represents the Trojan troops; observing to move them slowly both in advancing and retreating, to imitate a combat (G). Then draw up, by degrees, the sixth, on which are painted the fire, flame, and smoke, so that the palaces and houses painted on the first glass may appear to take fire gradually, and at last present a general conflagration. After having represented these incidents with the greatest attention, you let fall the curtain to prepare for the third act. In this may be represented the inside of Priam's palace; where is seen an altar, round which several Trojan princesses appear, who have fled thither for safety. On the first glass may be painted the palace. On the second, a view of

the back part of the palace, with the altar. On the third, Priam with several Trojan men and women. On the fourth, Pyrrhus and a troop of Greeks. On the fifth, the same actors, with the palace in flames. On the sixth, a conflagration.—The two first glasses which are to be drawn up, should be placed before you raise the curtain. Then pass the third; next advance the fourth; which being drawn up, discovers on the fifth the palace in flames; then drawing up the sixth, let down the first, that the palace may appear entirely destroyed by the conflagration.

The fourth act may represent the environs of Troy, with a distant prospect of the sea. The first and third glasses of the first act may be here used; to which may be added a third, representing Æneas bearing his father Anchises, followed by his son Iulus and some Trojans. With this glass may be represented the flight of the Trojans and the embarkment of Æneas; with another glass, on which are painted certain vessels.—To this act the following scenes may be added: The cave of Æolus; the back part of the cave; Æolus; the winds; Juno in her chariot.

The fifth act should represent the open sea, with the fleet of Æneas sailing for Italy. On the first glass must be painted the sea, as in the eleventh Experiment, or else the waves should be imitated by another glass under the first. On the second, the Trojan fleet. On the third, Neptune in his car. On the fourth, the palace of Jupiter. On the fifth, the inside of the palace; the gods assembled in council, with Venus obtaining leave of Jupiter for Æneas to land in Italy.—After having placed the first glass, that represents a calm sea, the curtain is raised, and the second scene is advanced, which contains the Trojan fleet. The first is then brought forward, to represent a violent tempest: then raising the third glass, Neptune appears, who commands the waves to be still, which is done by making the tempest subside by degrees. The fleet then advances, and passes over the whole theatre: presently after the fourth and fifth scenes descend, that represent Olympus, and finish the exhibition.

Note, We must here repeat, that if you would represent a subject of this sort to advantage, it is quite necessary that the glasses be well painted; and those that are to be in front should be in stronger and more opaque colours, that the images of those behind may not appear mixed with them, which will be the case if they are all equally transparent. The glasses should also be of different lengths; that some being placed before the others are drawn away, their extremities may not be perceived.

The larger these subjects are represented, the better effect they will have: the front of the theatre should appear to be about three feet wide; and if some parts of the figures were moveable, it would still add to the variety of the entertainment.

(G) He that moves the glasses, seeing the effect they produce, is the better able to render the representation as natural as possible.

Dioscorea
||
Diosma.

DIOSCOREA, in botany: A genus of the hexandria order, belonging to the diœcia class of plants; and in the natural method ranking under the 11th order, *Sarmentacea*. The male calyx is sexpartite; there is no corolla: The female calyx is sexpartite; no corolla; three styles; the capsule trilocular and compressed; and there are two membranaceous seeds. There are eight species, of which the only remarkable one is the bulbifera, or yam. This hath triangular winged stalks, which trail upon the ground, and extend a great way: these frequently put out roots from their joints as they lie upon the ground, by which the plants are multiplied. The roots are eaten by the inhabitants of both the Indies; and are particularly serviceable in the West India islands, where they make the greatest part of the negroes food. The plant is supposed to have been brought from the East to the West Indies; for it has never been observed to grow wild in any part of America; but in the island of Ceylon, and on the coast of Malabar, it grows in the woods, and there are in those places a great variety of sorts. It is propagated by cutting the root in pieces, observing to preserve an eye in each, as is practised in planting potatoes. One plant will produce three or four large roots. The skin of these roots is pretty thick, rough, unequal, covered with many stringy fibres or filaments, and of a violet colour approaching to black. The inside is white, and of the consistence of red beet. It resembles the potato in its mealiness, but is of a closer texture. When raw, the yams are viscous and clammy: when roasted or boiled, they afford very nourishing food; and are often preferred to bread by the inhabitants of the West Indies, on account of their lightness and facility of digestion. When first dug out of the ground, the roots are placed in the sun to dry: after which, they are either put into sand, dry garrets, or casks; where, if kept from moisture, they may be preserved whole years, without being spoiled or diminished in their goodness. The root commonly weighs two or three pounds; tho' some yams have been found upwards of 20 pounds weight.

DIOSCORIDES, a physician of Cilicia, who lived, as some suppose, in the age of Nero. He was originally a soldier; but afterwards he applied himself to study, and wrote a book upon medicinal herbs.

DIOSCURIA (*διοσκουρία*, from *Διος* Jupiter, and *κουροι* infants), in antiquity, a festival in honour of the *Διοσκουροι*, or Castor and Pollux, who were reputed to be the sons of Jupiter. It was observed by the Cyrenæans, but more especially by the Spartans, whose country was honoured by the birth of these heroes. The solemnity was full of mirth, being a time wherein they shared plentifully of the gifts of Bacchus, and diverted themselves with sports, of which wrestling matches always made a part.

DIOSMA, **AFRICAN SPIRÆA**: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is pentapetalous, the nectarium crown-shaped above the germen; there are five capsules coalited; the seeds hooded. There are nine species; of which the most remarkable are the *hirsuta*, with narrow hairy leaves; and the *oppositifolia*, with leaves placed in the form of a cross. The first is a very handsome shrub, growing to the

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height of five or six feet: the stalks are of a fine coral colour: the leaves come out alternately on every side of the branches, and are narrow-pointed and hairy: the flowers are produced in small clusters at the end of the shoots, and are of a white colour. They are succeeded by starry seed-vessels having five corners; in each of which corners is a cell, containing one smooth, shining, oblong, black seed: these seed-vessels abound with a resin which emits a grateful scent, as doth also the whole plant.—The second species rises to the height of three or four feet: the branches are slender, and produced from the stem very irregularly; the leaves are placed cross-ways; the flowers are produced at the ends of the branches, between the leaves: the plants continue a long time in flower, and make a fine appearance when they are intermixed with other exotics in the open air. Both species are propagated by cuttings; which may be planted during any of the summer-months in pots, and plunged into a moderate hot-bed, where they should be shaded from the sun, and frequently watered. In about two months they will have taken root; when each should be transplanted into a small pot where they are to remain; but during winter, like most other exotic plants, they must be preserved in a green-house.

DIOSPOLIS (anc. geog.), a city of the Delta, or Lower Egypt; to the south of the Busiritic branch, before it divides into two.—Another of Bithynia, in the territory of Heraclea.—A third, called *Magna*, denoting Thebæ of the Higher Egypt.—A fourth, *Diospolis Parva*, the metropolis of the Nomos Diospolites of the Higher Egypt.—A fifth, *Diospolis* of Samaria, the same with Lydda.—A sixth *Diospolis*, the ancient name of Laodicea of Phrygia on the Lycus.

DIOSPOLITES NOMOS (Ptolemy), a division of Thebais or the Higher Egypt, to distinguish it from another of the Lower Egypt or the Delta; to the south of the Nomos Thinites, on the west side of the Nile.

DIOSPYROS, the **INDIAN DATE-PLUM**: A genus of the diœcia order, belonging to the polygamia class of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is hermaphrodite and quadrifid; the corolla urceolated and quadrifid; there are eight stamina; the style quadrifid; the berry octospermous: the male calyx, corolla, and stamina, as in the former. There are two species. 1. The lotus, which is supposed to be a native of Africa, from whence it was transplanted into several parts of Italy, and also into the south of France. The fruit of this tree is supposed to be the lotus with which Ulysses and his companions were enchanted, and which made those who eat of it forget their country and relations: (See also *RHAMNUS*.) In the warm parts of Europe this tree grows to the height of 30 feet. In the botanic garden at Padua, there is one very old tree which has been described by some of the former botanists under the title of *guaiacum patavinum*. This tree produces plenty of fruit every year; from the seeds of which many plants have been raised. 2. The Virginiana, pinshamin, persimon, or pitchumôn plum, is a native of America, but particularly of Virginia and Carolina. The seeds of this sort have been frequently imported into Britain, and the trees are common in many nurseries about London. It rises to the height of 12 or 14 feet; but generally divides into many irregular

Diopolis
||
Diospyros.

Diphthong ||
Diploma-
tics. trunks near the ground, so that it is very rare to see a handsome tree of this sort. Though plenty of fruit is produced on these trees, it never comes to perfection in this country. In America the inhabitants preserve the fruit till it is rotten, as is practised with medlars in England; when they are esteemed very pleasant. Both species are propagated by seeds: and the plants require to be treated tenderly while young; but when they are grown up, they resist the greatest cold of this country.

DIPHTHONG, in grammar, a double vowel, or the mixture of two vowels pronounced together, so as to make one syllable.

The Latins pronounced the two vowels in their diphthongs *ae* or *æ*, *oe* or *œ*, much as we do; only that the one was heard much weaker than the other, tho' the division was made with all the delicacy imaginable. Diphthongs, with regard to the eyes, are distinguished from those with regard to the ears: In the former, either the particular sound of each vowel is heard in the pronunciation; or the sound of one of them is drowned; or, lastly, a new sound, different from either, results from both: the first of these only are real diphthongs, as being such both to the eye and ear. Diphthongs with regard to the ear are either formed of two vowels meeting in the same syllable, or whose sounds are severally heard; or of three vowels in the same syllable, which only afford two sounds in the pronunciation.

English diphthongs, with regard to the eye and ear, are *ai*, *au*, *ea*, *ee*, *oi*, *oo*, *ou*. Improper English diphthongs, with regard to the eye only, are *aa*, *ea*, *eo*, *eu*, *ie*, *ei*, *oa*, *oe*, *ue*, *ui*.

DIPLOE, in anatomy, the soft medullium, or medullary substance, which lies between the two laminae of the bones of the cranium. See **ANATOMY**, n° 11.

DIPLOMA. See **DIPLOMATICS**.

In a peculiar sense, it is used for an instrument or licence given by colleges, societies, &c. to a clergyman to exercise the ministerial function, or to a physician to practise the profession, &c. after passing examination, or admitting him to a degree.

*Bielfield's
Elements.*

DIPLOMATICS, the science of diplomas, or of ancient literary monuments, public documents, &c. It does not however, nor can it, absolutely extend its researches to antiquity; but is chiefly confined to the middle age, and the first centuries of modern times. For though the ancients were accustomed to reduce their contracts and treaties into writing; yet they graven them on tables, or covered them over with wax, or brass, copper, stone, or wood, &c. And all that in the first ages were not traced on brass or marble, has perished by the length of time, and the number of destructive events.

1. The word *diploma* signifies, properly, a letter or epistle, that is folded in the middle, and that is not open. But, in more modern times, the title has been given to all ancient epistles, letters, literary monuments, and public documents, and to all those pieces of writing which the ancients called *Syngrapha*, *Chirographa*, *Codicilli*, &c. In the middle age, and in the diplomas themselves, these writings are called *Littera*, *Præcepta*, *Placita*, *Chartæ indiculae*, *Sagilla*, and *Bulla*; as also *Pancharta*, *Pantocharta*, *Tractoria*, *Descriptiones*,

&c. The originals of these pieces are named *Exemplaria*, or *Autographa*, *Chartæ authenticae*, *Originalia*, &c. and the copies, *Apographa*, *Copiae*, *Particulæ*, and so forth. The collections that have been made of them, are called *Chartaria* and *Chartulia*. The place where these papers and documents were kept, the ancients named *Scrinia*, *Tabularium*, or *Ærarium*, words that were derived from the tables of brass, and, according to the Greek idiom, *Archeium* or *Archivum*.

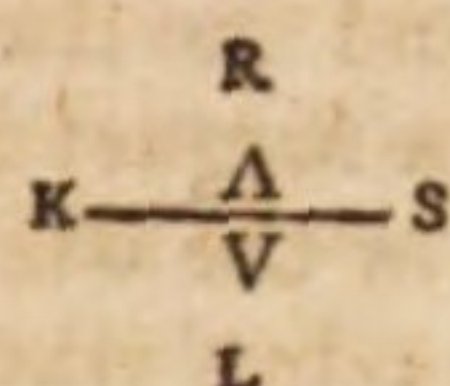
2. In order to understand the nature of these ancient papers, diplomas, and manuscripts, and to distinguish the authentic from the counterfeit, it is necessary to know that the paper of the ancients came from Egypt, and was formed of thin leaves or membranes, taken from the branches of a tree named *Papyrus*, or *Bibulum Ægyptiacum*, and which were pasted one over the other with the slime of the Nile, and were pressed and polished with a pumice-stone. This paper was very scarce; and it was of various qualities, forms, and prices, which they distinguished by the names of *charta hieratica*, *lurica*, *augusta*, *amphitheatrica*, *saitica*, *tanirica*, *emporetica*, &c. They cut this paper into square leaves, which they pasted one to the other, in order to make rolls of them: from whence an entire book was called *volumen*, from *volvendo*; and the leaves of which it consisted, *paginae*. Sometimes, also, they pasted the leaves all together by one of their extremities, as is now practised in binding; by this method they formed the back of a book, and these the learned call *codices*. They rolled the volume round a stick, which they named *umbilicus*; and the two ends that came out beyond the paper, *cornua*. The title, wrote on parchment, in purple characters, was joined to the last sheet, and served it as a cover. They made use of all sorts of strings or ribbands, and even sometimes of locks, to close the book; and sometimes also it was put into a case. But there is not now to be found, in any library or cabinet whatever, any one of these volumes. We have been assured, however, by a traveller, that he had seen several of them in the ruins of Herculaneum; but so damaged, the paper so stiff and brittle, by the length of time, that it was impossible to unroll them, and consequently to make any use of them; for on the first touch they fell into shatters.

3. We are ignorant of the precise time when our modern paper was invented: and when they began to make use of pens in writing, instead of the stalks of reeds. The ink that the ancients used, was not made of vitriol and galls, like the modern, but of soot. Sometimes also they wrote with red ink made of vermilion; or in letters of gold, on purple or violet parchment. It is not difficult for those who apply themselves to this study, to distinguish the parchment of the ancients from that of the moderns, as well as their ink and various exterior characters: but that which best distinguishes the original from the counterfeit is, the writing or character itself; which is so distinctly different from one century to another, that we may tell with certainty, within about 40 or 50 years, when any diploma was written. There are two works which furnish the clearest lights on this matter, and which may serve as sure guides in the judgments we may have occasion to make on what are called *ancient diplomas*. The one is the celebrated treatise on the Diplomatic, by F. Mabillon; and the other, the first volume of the *Chronicon*.

Diploma-tics. **Chronicon Gotvicense.** We there find specimens of all the characters, the flourishes, and different methods of writing, of every age. For these matters, therefore, we must refer our readers to those authors; and shall here only add, that,

4. All the diplomas are wrote in Latin, and consequently the letters and characters have a resemblance to each other: but there are certain strokes of the pen which distinguish not only the ages, but also the different nations; as the writings of the Lombards, French, Saxon, &c. The letters in the diplomas are also usually longer, and not so strong as those of manuscripts. There has been also introduced a kind of court-hand, of a very disproportionate length, and the letters of which are called *Exiles litteræ, crispæ, ac protrahiores*. The first line of the diploma, the signature of the sovereign, that of the chancellor, notary, &c. are usually wrote in this character.

5. The signature of a diploma consists either of the sign of the cross, or of a monogram or cipher, composed of the letters of the names of those who subscribed it. The initial letters of the name, and sometimes also the titles, were placed about this cross. By degrees the custom changed, and they invented other marks; as, for example, the sign of Charlemagne was thus:



They sometimes added also the dates and epoch of the signature, the feasts of the church, the days of the kalendar, and other like matters. The successive corruption of the Latin language, the style and orthography of each age, as well as their different titles and forms; the abbreviations, accentuation, and punctuation, and the various methods of writing the diphthongs; all these matters united, form so many characters and marks by which the authenticity of a diploma is to be known.

6. The seal annexed to a diploma was anciently of white wax, and artfully imprinted on the parchment itself. It was afterwards pendent from the paper, and inclosed in a box or case, which they called *bullæ*. There are some also that are stamped on metal, and even on pure gold. When a diploma bears all the characters that are requisite to the time and place where it is supposed to be written, its authenticity is not to be doubted: but, at the same time, we cannot examine them too scrupulously, seeing that the monks and priests of former ages have been very adroit in making of counterfeits; and the more, as they enjoyed the confidence of princes and statesmen, and were even sometimes in possession of their rings or seals.

7. With regard to manuscripts that were wrote before the invention of printing, it is necessary (1.) to know their nature, their essential qualities, and matter; (2.) to be able to read them freely, and without error; (3.) to judge of their antiquity by those characters which we have just mentioned with regard to the diplomas; and, (4.) to render them of use in the sciences. As there are scarce any of the ancient codes now remaining (see par. 2.), wrote on the Egyptian paper, or on wood, ivory, &c. we have only to consider those that are written on parchment or vellum (*membraneos*),

and such as are wrote on our paper (*chartaceos*). The former of these are in most esteem. With regard to the character, these codes are written either in square and capital letters, or in half square, or round and small letters. Those of the first kind are the most ancient. There are no intervals between the words, no letters different from the others at the beginning of any word, no points, nor any other distinction. The codes which are wrote in letters that are half square, resemble those we have in Gothic characters, as well for the age as the form of the letters. Such as are wrote in round letters are not so ancient as the former, and do not go higher than the ninth or tenth century. These have spaces between the words, and some punctuation. They are likewise not so well wrote as the preceding, and are frequently disfigured with comments. The codes are divided, according to the country, into Lombard, Italian, Gaulic, Franco-Gaulic, Saxon, Anglo-Saxon, &c.

8. In the ancient Greek books, they frequently terminated the periods of a discourse, instead of all other division, by lines; and these divisions were called, in Latin, *versus*, from *vertendo*: for which reason these lines are still more properly named *versus* than *lineæ*. At the end of a work, they put down the number of verses of which it consisted, that the copies might be more easily collated: and it is in this sense we are to understand Trebonius, when he says, that the pandects contain 150,000 *pæne versusum*. These codes were likewise *vel probæ vel deterioris notæ*, more or less perfect, not only with regard to the calligraphy or beauty of the character, but to the correction of the text also.

9. It is likewise necessary to observe, in ancient codes, the abbreviations, as they have been used in different centuries. Thus, for example, A. C. D. signifies, Aulus Caius Decimus; Ap. Cn. Appius Cneius; Aug. Imp. Augustus Imperator. The characters that are called *notæ*, are such as are not to be found in the alphabet; but which, notwithstanding, signify certain words. All these matters are explained in a copious manner by Vossius, and in the *Chronicon Gotvicense*. Lastly, the learned divide all the ancient codes into *codices minus raros, rariores, editos, & anecdotos*. The critical art is here indispensably necessary: its researches, moreover, have no bounds; and the more, as the use of it augments every day, by the discoveries that are made in languages, and by the increase of erudition.

DIPONDIUS, in the scripture-language, is used by St Luke to signify a certain coin which was of very little value. Our translation of the passage is, *Are not two sparrows sold for two farthings?* In St Matthew, who relates the same thing, we read *Are not two sparrows sold for a farthing?* The Greek reads *assarion* instead of *as*. Now *assarion*, as some say, was worth half an *as*, that is to say, four French deniers and $\frac{1}{8}$ th; and, according to others, two deniers and $\frac{1}{8}$ ths. *Dipondius* seems rather to signify half an *as*. Calmet, *Diction. Bibl.* Luke xii. 6. Matt. x. 29.

Dr Arbuthnot differs in opinion from the author last quoted. He says, that this coin was at first *libralis*, or of a pound weight; and even when diminished, it retained the name of *libella*. So that *dipondius* denotes two *asses*.

DIPPING, among miners, signifies the interruption

Dipping-
Needle.

tion or breaking off the veins of ore; an accident that gives them a great deal of trouble before they can discover the ore again. A great deal of the skill of the miners consists in the understanding this dipping of the veins, and knowing how to manage in it. In Cornwall they have this general rule to guide them in this respect: most of their tin-loads, which run from east to west, constantly dip towards the north. Sometimes they underlie; that is, they slope down towards the north three feet in height perpendicular. This must carefully be observed by the miners, that they may exactly know where to make their air-shafts when occasion requires; yet, in the higher mountains of Dartmaer, there are some considerable loads, which run north and south; these always underlie toward the east. Four or five loads may run nearly parallel to each other in the same hill; and yet, which is rare, they may meet all together in one hatch, as it were a knot, which well tins the place, and so separate again, and keep their former distances.

DIPPING-Needle, an instrument used for observing the quantity of inclination towards the earth, assumed by any needle or other body after it has acquired the magnetic virtue. This was first observed by one Robert Norman, an Englishman, and maker of compasses for mariners, in the end of the 16th century; who finding that he was always obliged to counterbalance that end which turns to the north by a bit of wax or such other substance, though the balance had been ever so exact before, published an account of his discovery as a matter of importance. The subject was instantly attended to; and instruments were not only contrived for ascertaining the quantity of the dip, but various speculations formed concerning the cause of such a surprising phenomenon.

The general phenomena of the dipping-needle are: That about the equatorial parts of the earth it remains in an horizontal position, but depresses one end as we recede from these; the north end if we go towards the north, and the south end if we proceed towards the south pole. The farther north or south that we go, the inclination becomes the greater; but there is no place of the globe hitherto discovered where it points directly downwards, though it is supposed that it would do so in some part very near the pole. Its inclination is likewise found to vary very considerably at different times in different places of the earth, and by some changes of situation in such a manner as must appear at first sight very unaccountable. Of all those who have attempted the investigation of this obscure subject, none have been more successful than M. Cavallo, who in his *Treatise on Magnetism* has given particular attention to all the phenomena, and accounted for them upon plain and rational principles, in the following manner.

The dip of the magnetical needle in general may be understood from the following easy experiment: Lay an oblong magnet horizontally upon a table, and over it suspend another smaller magnet (a sewing needle to which the magnetic virtue has been communicated will answer the purpose), in such a manner as to remain in an horizontal position when not disturbed by another magnet. Now, if this last small magnet or sewing needle, suspended by the middle, be brought

just over the middle of the large one, it will turn itself in such a manner that the south pole of the small magnet will point towards the north pole of the large one; and if at an equal distance from both, will remain in an horizontal position. But if we move it nearer to one of the poles than the other, it will readily be understood that the corresponding end of the needle will be attracted by the pole to which it approaches, and of consequence inclined downwards; the contrary end being proportionably elevated. It is likewise evident, that this inclination will be greater or less according to the distance at which the small magnet is placed from the pole of the large one; the attraction of the nearest pole having always the greatest effect upon it. And it is equally plain, that when brought directly over one of the poles of the large magnet, it will turn its own contrary one directly towards it, and thus lie exactly in the axis of the large one.

The application of this experiment to the phenomena of the dipping-needle is obvious, as nothing more is requisite for solving the whole mystery than to suppose the earth itself to be the large magnet, and the magnetic needle or any other magnetic body the small magnet in the experiment: for admitting that the north pole of the earth possesses a south magnetism, and that the opposite pole is possessed of a north magnetical polarity; it appears, and the theory is confirmed by experiment, that when a magnet is suspended properly in the equatorial parts of the world, it must remain in an horizontal position; but when removed nearer to one of the poles, it must incline one of its extremities, viz. that which is possessed of the contrary magnetic polarity; and that this inclination must increase in proportion as the magnet or magnetic-needle recedes from the equator of the earth; and, lastly, when brought exactly upon either of the poles of the earth, it must stand perpendicular to the ground, or in the same direction with the axis of the earth.

The only difficulty in this explanation arises from the attributing a south magnetism to the north pole of the earth: but by this our author means only that its magnetism is contrary to that end of the magnetic needle which turns towards it; and in the same manner it must be understood, that the south pole of the earth has a north magnetic polarity.

If the extremities of the axis of the earth, or the poles about which it performs its diurnal revolution, coincided with its magnetic poles, or even if the magnetic poles were always at a certain distance from them, the inclination of the needle would be always the same at equal distances from the equator, and might be very useful for determining the latitudes. But it would seem, that these poles are perpetually shifting their place, since both the inclination and horizontal direction of the needle are continually varying even in the same place; so that its quantity of inclination cannot be exactly calculated. Two general remarks may be made upon this subject. 1. That the inclination of the needle does not alter regularly in going from north to south, or from south to north, in any meridian. 2. That its alteration in the same place, and at different times, is but small. Thus, in London, about the year 1576, the dip was $71^{\circ} 50'$ below the horizon, and in 1775 it stood at $72^{\circ} 3'$; the alteration in near 200 years

Dipping-
Needle.

Dipping-
Needle,
Dipsacus.

years scarce amounting to three quarters of a degree, which may be attributed to the errors of the instruments; as these were at first exceedingly erroneous, and even yet are far from being arrived at perfection.

The general method of constructing dipping-needles is, to pass an axis quite through the needle itself, and to let the extremities of the axis rest upon two supports, like the beam of a pair of scales, that the needle may move vertically round; and hence, when placed in the magnetic meridian, it will naturally assume that position which is called the *magnetic line*, viz. the two ends nearly north and south, and one of them inclined considerably to the horizon. The degrees of this inclination are shown upon a graduated circle; and when the instrument is made use of at land it has a stand, but at sea a ring is necessary to suspend it. When furnished with a stand, it has also a spirit-level; and the stand has three screws, by which the whole is adjusted in such a manner as to let the centre of motion in the needle, and the mark of 90° on the lower part of the divided circle, be exactly in the same line perpendicular to the horizon.

The greatest imperfections attending this instrument are the balancing of the needle itself, and the difficulty of knowing whether, after being made magnetic, it be properly balanced or not. The inaccuracy here indeed can be but very small, as arising only from dust or moisture. The method recommended by Mr Cavallo to obviate these inconveniences, is first to observe the dip of the needle; then to reverse its magnetism by the application of magnets, so that the end of it which before was elevated above the horizon may now be below it; and, lastly, to observe its dip again; for a mean of the two observations will be pretty near the truth, though the needle may not be perfectly balanced. See MAGNETISM, and MAGNETICAL Needle.

DIPSACUS, TEAZEL, in botany: A genus of the monogynia order, belonging to the tetrandia class of plants; and in the natural method ranking under the 48th order, *Aggregate*. The common calyx is polyphyllous, proper above; the receptacle paleaceous. There are four species; the most remarkable of which is the *carduus fullonum*, which grows wild in many parts of England. It is of singular use in raising the knap upon woollen cloth. For this purpose, the heads are fixed round the circumference of a large broad wheel, which is made to turn round, and the cloth is held against them. In the west of England, great quantities of the plant are cultivated for the use just now mentioned. It is propagated by sowing the seeds in March, upon a soil that is well prepared. About one peck of seed is sufficient for an acre, as the plants must have room to grow; otherwise the heads will not be large enough, nor in great quantity. When the plants come up, they must be hoed in the same manner as is practised for turnips, cutting down all the weeds, and thinning the plants to about eight inches distance; and as the plants advance, and the weeds begin to grow again, they must be hoed a second time, cutting out the plants to a wider distance, so that they may finally stand a foot distant from each other. The second year they will shoot up heads, which may be cut about the beginning of August. They are then to be tied up in bunches, and set in the sun if the weather is fair; or if not, in rooms to dry them. The common produce

is about 160 bundles or staves upon an acre, which are sold for one shilling each.

The leaves of the common wild teazel, dried, and given in powder or infusion, are a very powerful remedy against flatulencies and crudities in the stomach. There is also another, though somewhat whimsical, use for which this plant is famous among the country people in England. If the heads are opened longitudinally, about September or October, there is generally found a small worm in them: one of these only is found in each head, whence naturalists have named it the *vermis solitarius dipsaci*. They collect three, five, or seven of these, always observing to make it an odd number; and, sealing them up in a quill, give them to be worn as an amulet against the ague. This superstitious remedy is in much higher repute than the bark, in many parts of England.

DIPSAS, a sort of serpent, the bite of which produces such a thirst as proves mortal; whence its name *dipsas*, which signifies thirsty. In Latin it is called *fiula*, "a pail." Moses speaks of it in Deut. viii. 15.

DIPTERA (from *dis*, and *τερον*, wing), in zoology, an order of insects, which have only two wings, and under each wing a style or oblong body, terminated by a protuberance or head, and called a *balancer*.

DIPTOTES, in grammar, are such nouns as have only two cases, as *suppetia*, *suppetias*, &c.

DIPTYCHA, in antiquity, a public register, wherein were written the names of the consuls, and other magistrates, among the heathens; and of bishops, and defunct as well as surviving brethren, among the Christians.

The word is formed from the Greek *διπτυχον*, or *διπτυχα*, and that from *διπτει*, a masculine noun derived from *πτυσσει* I fold, or plait. From its future *πτυσω* is formed *πτυξ* a fold or plait, to which adding *dis* twice, we have *διπτει*, in the genitive *διπτυχου*, whence the nominative neuter *διπτυχον*, q. d. a book folded in two leaves; though there were some in three, and others in four or five leaves. An ingenious author imagines this name to have been first given them to distinguish them from the books that were rolled, called *volumina*.

It is certain there were profane diptycha in the Greek empire, as well as sacred ones in the Greek church. The former were the matricula, or register, wherein the names of the magistrates were entered; in which sense diptycha is a term in the Greek chancery.

Sacred DIPTYCHA. The word is plural; diptycha being a double catalogue, in one whereof were written the names of the living, and in the other those of the dead, which were to be rehearsed during the office. We meet with something not unlike the sacred diptychs of the Greeks, in the canon of the mass according to the Latin usage; where the people are enjoined to pray once for the living, and once for the dead; several saints are invoked in different times, &c. In these diptycha were entered the names of bishops, who had governed their flocks aright; and these were never expunged out of the same, unless they were convicted of heresy, or some other gross crime. In the diptycha were likewise entered the names of such as had done any signal service to the church, whether they were living

Dipsas

||
Diptycha.

Dirca
||
Diribitores.

living or dead, and mention was made of them in the celebration of the liturgy.

Casaubon, in his observations on Athenæus, lib. vi. cap. 14. supposes the Christians to have borrowed the custom of writing names in a book, and rehearsing them at mass, from the heathens, who entered the names of persons they would do any signal honour to, in the verses of the Salii; as was done to Germanicus and Verus, sons of the emperor Marcus Aurelius, and long time before, during the age of the republic, to Mamurcus Veturius, and Lucia Volumnia, as we are told by Tacitus, lib. ii. Spartian, Ovid, Festus, Plutarch, &c. But Fa. Rosweyd does not approve this notion of Casaubon. The pretended St Dionysius, a very ancient author, says the contrary, and asserts the first establishment of this usage to have been founded on Scripture, 2 Tim. ii. 19. Psalm cxvi. 15. Rosweyd adds Ecclesiastic. xlv. 1. and takes these to have been the passages the ancient church had a view to, rather than the Salian verses.

The profane diptycha were frequently sent as presents to princes, &c. on which occasion they were finely gilt, and embellished; as appears from Symmachus, lib. ii. ep. 81. Those presented were usually of ivory. The first law, De Expens. Ludor. C. Theod. forbids all magistrates below consuls to make presents of diptycha of ivory in the public ceremonies.

DIRCA, in botany: A genus of the monogynia order, belonging to the octandria class of plants; and in the natural method ranking under the 31st order, *Veprerule*. There is no clayx; the corolla is tubular, with the limb indistinct; the stamina are longer than the tube; the berry is monospermous.

DIRÆ, the general name of the three Furies in the Pagan system of theology. They were so called, as being *quasi Deorum iræ*, the ministers of divine vengeance in punishing guilty souls after death. They were the daughters of *Night* and *Acheron*. See FURIES.

DIRECTION, in mechanics, signifies the line or path of a body's motion, along which it endeavours to proceed according to the force impressed upon it. See MECHANICS.

DIRECTOR, in commercial polity, a person who has the management of the affairs of a trading company: thus we say, the directors of the India company, South-sea company, &c. See COMPANY.

The directors are considerable proprietors in the stocks of their respective companies, being chosen by plurality of votes from among the body of proprietors. The Dutch East India company have 60 such directors; that of France, 21; the British East India company has 24, including the chairman, who may be re-elected for four years successively. These last have salaries of 150l. a-year each, and the chairman 200l. They meet at least once a-week, and commonly oftener, being summoned as occasion requires. The directors of the Bank of England are 24 in number, including governor and deputy governor.

DIRECTOR, in surgery, a grooved probe, to direct the edge of the knife or scissars in opening sinuses or fistulæ, that by this means the adjacent vessel, nerves, and tendons, may remain unhurt. See SURGERY.

DIRIBITORES, among the Romans, officers appointed to distribute tablets to the people at the comitia. See COMITIA.

DIRIGENT, or DIRECTRIX, a term in geometry, signifying the line of motion, along which the described line or surface is carried in the genesis of any plane or solid figure.

Dirigent
||
Disappoint-
ment.

DIS, an inseparable article prefixed to divers words; the effect whereof is either to give them a signification contrary to what the simple words have, as *disoblige*, *disobey*, &c.; or to signify a separation, detachment, &c. as *disposing*, *distributing*.

DIS, a town of Norfolk, seated on the river Wavenay, on the side of a hill. It is a neat flourishing town, with one large church, a Presbyterian and a Quaker meeting. It has about 600 good houses, the streets are well paved, pretty wide, and always clean. At the west end of the town is a large meer or lake; but so muddy, that the inhabitants can make no other use of it but in catching of eels. In the town are carried on manufactories of sail-cloth, hose, and the making of stays. E. Long. 1. 16. N. Lat. 52. 25.

DIS, a god of the Gauls, the same as Pluto the god of hell. The inhabitants of Gaul supposed themselves descended from that deity.

DISA, in botany: A genus of the diandria order, belonging to the gynandria class of plants. The spathe is univalvular; the petals three; the third smaller than the rest, bifid, and gibbous at the base.

DISABILITY, in law, is when a man is disabled, or made incapable to inherit any lands, or take that benefit which otherwise he might have done: and this may happen four ways; by the act of an ancestor, or of the party himself; by the act of God, or of the law. 1. Disability by the act of the ancestor, is where the ancestor is attainted of high treason, &c. which corrupts the blood of his children, so that they may not inherit his estate. 2. Disability by the act of the party, is where a man binds himself by obligation, that, upon surrender of a lease, he will grant a new estate to a lessee; and afterwards he grants over the reversion to another, which puts it out of his power to perform it. 3. Disability by the act of God, is where a man is *non sana memoria*, whereby he is incapable to make any grant, &c. So that, if he passeth an estate out of him, it may after his death be made void; but it is a maxim in law, "That a man of full age shall never be received to disable his own person." 4. Disability by the act of the law, is where a man by the sole act of the law, without any thing by him done, is rendered incapable of the benefit of the law; as an alien born, &c.

DISANDRA, in botany: A genus of the digynia order, belonging to the heptandria class of plants. The calyx has seven leaves; the corolla parted into seven, and flat; the capsule two-celled.

ISLANDS OF DISAPPOINTMENT, are a cluster of small islands, lying in S. Lat. 14. 10. W. Long. 141. 16. They were discovered by Commodore Byron in 1765, who gave them their name from the shores affording no anchorage for his ships; for which reason he was obliged to quit them without landing, or procuring any refreshments for his crew, who were then languishing with sickness. They are inhabited by Indians, who appeared on the beach with spears in their hands, that were at least 16 feet long. They every where discovered hostile intentions, and seemed by signs to threaten the people in the boat with death if they came

Disc. came ashore. There are cocoa-trees in great abundance, and the shore abounds with turtle.

Discipline. **DISC**, in antiquity, a quoit made of stone, iron, or copper, five or six fingers broad, and more than a foot long, inclining to an oval figure, which they hurled in form of a bowl, to a vast distance, by the help of a leathern thong tied round the person's hand who threw it, and put through a hole in the middle. Homer has made Ajax and Ulysses great artists at this sport.

Disc, in astronomy, the body and face of the sun and moon, such as it appears to us on the earth; or the body and face of the earth, such as it appears to a spectator in the moon.

Disc, in optics, is the width of the aperture of telescopic glasses, whatever their form be, whether plain, convex, concave, &c.

DISCERNING, or **DISCERNMENT**, a faculty of the mind whereby it distinguishes between ideas. See **METAPHYSICS**.

DISCIPLE, one who learns any thing from another: thus, the followers of any teacher, philosopher, &c. are called *disciples*. In the Christian sense, they were followers of Jesus Christ, in general; but in a more restrained sense, the disciples denote those alone who were the immediate followers and attendants on his person, of which there were 70 or 72. The names *disciple* and *apostle* are often synonymously used in the gospel-history; but sometimes the apostles are distinguished from disciples, as persons selected out of the number of disciples, to be the principal ministers of his religion: of these there were only 12. The Latins kept the festival of the 70 or 72 disciples on July 15th, and the Greeks on January 4th.

DISCIPLINE, in a general sense, denotes instruction and government, as military discipline, ecclesiastical discipline, &c.

Ecclesiastical discipline consists in putting those laws in execution by which the church is governed, and inflicting the penalties enjoined by them against the several sorts of offenders that profess the religion of Jesus. The primitive church never pretended to exercise discipline upon any but such as were within her pale, in the largest sense, by some act of their own profession; and even upon these she never pretended to exercise her discipline so far as to cancel or disannul their baptism: all that she pretended to, was to deprive men of the benefits of external communion, such as public prayer, receiving the eucharist, and other acts of divine worship. The church-discipline was only confined to the admonition of the party, and to the lesser and greater excommunication.

As to the objects of ecclesiastical discipline, they were all such delinquents as fell into great and scandalous crimes after baptism.

Discipline, in a more peculiar sense, is used for the chastisements or bodily punishments inflicted on a religious of the Romish church who has been found a delinquent; or even for that which the religious voluntarily undergo or inflict on themselves, by way of modification.

Book of DISCIPLINE in the history of the church of Scotland, is a common order, drawn up by the assembly of ministers in 1650, for the reformation and

uniformity to be observed in the discipline and policy of the church. In this book the government of the church by prelates is set aside, church-sessions are established, the superstitious observation of fast-days and saints days is condemned, and other regulations for the government of the church are determined. This book was approved by the privy-council, and is called *the first book of discipline*.

DISCORD, in general, signifies disagreement, or opposition between different persons or things.

DISCORD, in music, every sound which, joined with another, forms an assemblage disagreeable to the ear; or rather, every interval whose extremes do not coalesce. Now, as there are no other concords or consonances, except those which form amongst themselves, and with their fundamental sound, perfect chords, it follows, that every other interval must be a real dissonance or discord: even the third and sixth were reckoned such among the ancients, who excluded them from the number of consonant chords.

The term *dissonance*, which is synonymous with discord, is compounded of two words, the inseparable preposition *dis* and the verb *sonare*; which, both in a literal and metaphorical sense, signifies *disagreement* or *disunion*. In reality, that which renders dissonances grating, is, that the sounds which form them, far from uniting in the ear, seem to repel each other, and are heard each by itself as two distinct sounds tho' produced at the same time.

This repulsion or violent oscillation of sounds is heard more or less as the vibrations which produce it are more or less frequently coincident. When two vocal strings are gradually tuned, till they approach a consonant interval, the pulsations become slower as the chord grows more just, till at last they are scarcely heard, if heard at all; from whence it appears certain, that the pleasure produced in us by harmony results from the more or less exact and frequent coincidence of vibrations; though the reason why this coincidence should give pleasure, more than any other modification or combination of sounds, appears to us inscrutable. The agreeable effects of dissonance in harmony, are no objection to this theory; since it is allowed, that the sensations excited by discord are not in themselves immediately and necessarily pleasing, but only please by auricular deception. The ear is surprised with the shock it receives, without being able to imagine how it should have happened; and in proportion as it is harsh and grating, we feel the pleasure of returning harmony enhanced, and the disappointment of being artfully and insensibly extricated more agreeable.

The name of *dissonance*, is given sometimes to the interval, and sometimes to each of the two sounds which form it. But though two sounds equally form a dissonance between themselves, the name is most frequently given to that sound in particular which is most extraneous to the chord.

The number of possible dissonances is indefinite; but as in music we exclude all intervals which are not found in the system received, the number of dissonances is reduced to a very few: besides, in practice, we can only select from those few, such as are agreeable to the species, and the mode in which we compose; and from

this

Discord.

Discord
||
Discount.

this last number we must exclude such as cannot be used consistently with the rules prescribed. But what are these rules? Have they any foundation in nature, or are they merely arbitrary? This is what Rousseau, whom in this article we have followed or abandoned as his observations appeared useful or frivolous, proposes to investigate as its principal object.

But where does his scrutiny terminate? Not in the abolition of the rules prescribed. These have still subsisted, and will still subsist, while the frame of man, and the nature of music, remain what they are. If then the rules be permanent and universal, the principle upon which they are founded may be latent or ambiguous; but the rules themselves can never be purely arbitrary. How else could it happen, that Rameau, D'Alembert, and Rousseau, should admit the force and effect of these rules, whilst each of those masters exerts his whole genius to give a different account of their cause and origin? Rousseau himself, as we have seen in a former article, inculcates the necessity of dissonances for the completion of harmony; (see CHORD). Now if this be true, the easiest methods of introducing and dismissing these discords must be the most eligible, and of consequence the rules for using them must be established. It is not then upon the subsistence or demolition of any particular theory that they depend. Should we attend to the particular objections which may be urged against any system whatever; where is the theory which will be found proof against the efforts of scepticism? After all, the objections of Rousseau against Rameau's theory, as applied by D'Alembert to the origin of consonances, (see MUSIC, art. 94, 95, 96, 97, 98, 99,) appear to be much more frivolous than the analogies from which he pretends this origin to be deduced. It appears from D'Alembert's exposition of this theory, that, if not for all, it affords a solution for the most material and essential phenomena in harmony; which is sufficient for its establishment, till another can be found, which gives a rational and consistent account of the whole: a discovery which has not yet been made. But, whilst we acknowledge the futility of Rousseau's objections against D'Alembert's explication of dissonances, we must at the same time admire the ingenuity with which he has deduced them from principles purely mechanical, without departing from the system of M. Rameau. This mechanical explication will be found in his Musical Dictionary, under the article *Dissonance*.

DISCORD, (the goddess of), in Pagan theology. She is represented by Aristides with fiery eyes, a pale countenance, livid lips, and wearing a dagger in her bosom. It was she who at the marriage of Peleus and Thetis threw in the golden apple, whereon was written "To the fairest:" which occasioned a contention between the goddesses Juno, Minerva, and Venus; each pretending a title to the apple. She was likewise called *Ate* and *Eris*.

DISCOVERY, in dramatic poetry, a manner of unravelling a plot or fable in tragedies, comedies, and romances; wherein, by some unforeseen accident, a discovery is made of the name, fortune, quality, &c. of a principal person, which were before unknown. See CATASTROPHE.

DISCOUNT, in commerce, a term among traders, merchants, and bankers. It is used by the two former
N^o 102.

on occasion of their buying commodities on the usual time of credit, with a condition that the seller shall allow the buyer a certain discount at the rate of so much *per cent. per annum*, for the time for which the credit is generally given, upon condition that the buyer pays ready money for such commodities, instead of taking the time of credit. Traders and merchants also frequently taking promissory notes for moneys due payable to them or order at a certain time, and sometimes having occasion for money before the time is elapsed, procure these notes to be discounted by bankers before the time of payment. Bills of exchange are also discounted by bankers; and in this consists one article of the profits of banking. See BANK.

DISCRETE, or DISJUNCT, PROPORTION, is when the ratio of two or more pairs of numbers or quantities is the same, but there is not the same proportion between all the four numbers. Thus if the numbers 3 : 6 :: 8 : 16 be considered, the ratio between 3 : 6 is the same as that between 8 : 16, and therefore the numbers are proportional: but it is only discretely or disjunctly, for 3 is not to 6 as 6 to 8; that is, the proportion is broken off between 8 and 3, and is not continued as in the following continual proportionals, 3 : 6 :: 12 : 24.

DISCRETION, prudence, or knowledge to govern one's self.

There are many more shining qualities in the mind of man, but there is none so useful as discretion; it is this indeed that gives a value to all the rest, which sets them at work in their proper times and places; and turns them to the advantage of the person who is possessed of them. Without it learning is pedantry, and wit impertinence; virtue itself looks like weakness; the best parts only qualify a man to be more sprightly in errors, and active to his own prejudice.

Nor does discretion only make a man master of his own parts, but of other mens. The discreet man finds out the talents of those he converses with, and knows how to apply them to proper uses. Accordingly, if we look into particular communities and divisions of men, we may observe that it is the discreet man, not the witty, nor the learned, nor the brave, who guides the conversation, and gives measures to the society. A man with great talents, but void of discretion, is like Polyphemus in the fable, strong and blind, endued with an irresistible force, which for want of sight is of no use to him. Though a man has all other perfections, and wants discretion, he will be of no great consequence in the world; but if he has this single talent in perfection, and but a common share of others, he may do what he pleases in his particular station of life.

It is proper, however, to distinguish between *discretion* and *cunning*, the latter being the accomplishment only of little mean ungenerous minds. Discretion points out the noblest ends to us, and pursues the most proper and laudable methods of attaining them: cunning has only private selfish aims, and sticks at nothing which may make them succeed. Discretion has large and extended views, and, like a well-formed eye, commands a whole horizon: cunning is a kind of short-sightedness, that discovers the minutest objects which are near at hand, but is not able to discern things at a distance. Discretion, the more it is discovered, gives the greater authority to the person who possesses it: cunning,

Discrete,
Discretion.

Discus
||
Disease.

cunning, when it is once detected, loses its force, and makes a man incapable of bringing about even those events which he might have done, had he passed only for a plain man. Discretion is the perfection of reason, and a guide to us in all the duties of life; cunning is a kind of instinct, that only looks out after our immediate interest and welfare. Discretion is only found in men of strong sense and good understanding: cunning is often to be met with in brutes themselves, and in persons who are but the fewest removes from them. In short, cunning is only the mimic of discretion, and may pass upon weak men, in the same manner as vivacity is often mistaken for wit, and gravity for wisdom.

DISCUS, in antiquity. See Disc.

Discus, in botany, the middle part of a radiated compound flower, generally consisting of small florets, with a hollow regular petal. It is commonly surrounded by large, plain, or flat, tongue-shaped petals, in the circumference or margin; as in daisy, groundsel, and leopards bane: sometimes the circumference is naked, as in cotton-weed and some species of colts-foot.

Discus Folii, the surface of the leaf.

DISCUSSION, in matters of literature, signifies the clear treating or handling of any particular point, or problem, so as to shake off the difficulties with which it is embarrassed: thus we say, *such a point was well discussed*, when it was well treated of and cleared up.

DISCUTIENTS, in medicine, are such remedies, as, by their subtilty, dissolve a stagnating or coagulated fluid, and dissipate the same without an external solution of continuity.

DISDIACLASTIC CRYSTAL, in natural history, a name given, by Bartholine and some others, to the pellucid fossile substance, more usually called, from the place whence it was first brought, *Island crystal*; tho' properly it is no crystal at all, but a fine pellucid spar, called by Dr Hill, from its shape, *parallelopipedum*. See *Island Crystal*.

DISDIAPASON, or BISDIAPASON, in music, a compound concord, described by F. Parran, in the quadruple ratio of 4 : 1, or 8 : 2.

DISDIAPASON Diapente, a concord in a sextuple ratio of 1 : 6.

DISDIAPASON Semi-Diapente, a compound concord in the proportion of 16 : 3.

DISDIAPASON Ditone, a compound consonance in the proportion of 10 : 2.

DISDIAPASON Semi-Ditone, a compound concord in the proportion of 24 : 5.

DISEASE, has been variously defined by physicians, almost every founder of a new system having given a definition of *disease*, differing in some respects from his predecessors. For a particular account of these definitions, see *MEDICINE*.

Of all animals, man is subject to the most diseases; and of men, the studious and speculative are most exposed thereto. Other animals have their diseases; but they are in small number: nor are plants without them; though their maladies scarce exceed half a score. The ancients deified their diseases. Some diseases only impair the use of the part immediately affected; as the ophthalmia, gout, &c. Others destroy it entirely; as

the *gutta serena*, palsy, &c. Some affect the whole body; as the fever, apoplexy, epilepsy, &c. Others only impair a part; as the asthma, colic, dropsy, &c. Some only affect the body; as the gout: others disturb the mind; as melancholy, delirium, &c. Lastly, others affect both the body and mind; as the mania, phrensy, &c.

The colder the country, in general, the fewer and the less violent are the diseases. Scheffer tells us that the Laplanders know no such thing as the plague, or fevers of the burning kind, nor are subject to half the distempers we are. They are robust and strong, and live to 80, 90, and many of them to more than 100 years; and at this great age they are not feeble and decrepid as with us; but a man of 90 is able to work or travel as well as a man of 60 with us. They are subject, however, to some diseases more than other nations: thus they have often distempers of the eyes, which is owing to their living in smoke, or being blinded by the snow. Pleurifies and inflammations of the lungs are also very frequent among them; and the small-pox often rages with great violence. They have one general remedy against these and all other internal diseases: this is the root of that sort of moss, as Scheffer expresses it, which they call *jerth*. They make a decoction of this root in the whey of rein-deer milk, and drink very large doses of it warm, to keep up a breathing sweat; if they cannot get this, they use the stalks of angelica boiled in the same manner: they have not so great an opinion of this as of the other remedy; but the keeping in a sweat, and drinking plentifully of diluting liquors, may go a great way in the cure of their diseases, whether either the one or the other of the drugs have any virtue or not. They cure pleurifies by this method in a very few days; and get so well through the small-pox with it, that very few die of it.

It has been always observed, that people of particular places were peculiarly subject to particular diseases, which are owing to their manner of living, or to the air and effluvia of the earth and waters. Hoffman has made some curious observations on diseases of this kind. He observes, that swellings of the throat have always been common to the inhabitants of mountainous countries: and the old Roman authors say, Who wonders at a swelled throat in the Alps? The people of Switzerland, Carynthia, Styria, the Hartz forest, Transylvania, and the inhabitants of Cronstadt, he observes, are all subject to this disease from the same cause.

The French are peculiarly troubled with fevers, with worms, and with hydroceles and sarcocoles; and all these disorders seem to be owing originally to their eating very large quantities of chesnuts. The people of our own nation are peculiarly afflicted with hoarsenesses, catarrhs, coughs, dysenteries, consumptions, and the scurvy; and the women with the *fluor albus* or whites; and children with a disease scarce known elsewhere, which we call the *rickets*. In different parts of Italy different diseases reign. At Naples the venereal disease is more common than in any other part of the world. At Venice, people are peculiarly subject to the bleeding piles. At Rome, tertian agues and lethargic distempers are most common. In Tuscany, the epilepsy or falling sickness. And in Apulia they are most subject to burning fevers, pleurifies, and to that sort of madness which is attributed to the bite of the tarantula,

Disease
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Disjunc-
tive.

and which, it is said, is only to be cured by music. In Spain apoplexies are common, as also melancholy, hypochondriacal complaints, and bleeding piles. The Dutch are peculiarly subject to the scurvy, and to the stone in the kidneys. Denmark, Norway, Sweden, Pomerania, and Livonia, are all terribly afflicted with the scurvy: and it is remarkable, that in Denmark, Sweden, and Norway, fevers are very common; but in Iceland, Lapland, and Finland, there is scarce ever such a disease met with; though peripneumonies are very common in these places, as also diseases of the eyes and violent pains of the head. The Russians and Tartars are afflicted with ulcers, made by the cold, of the nature of what we call chilblains, but greatly worse; and in Poland and Lithuania there reigns a peculiar disease called the *plica polonica*, so terribly painful and offensive, that scarce any thing can be thought of worse. The people of Hungary are very subject to the gout and rheumatism: they are more infested also with lice and fleas than any other people in the world, and they have a peculiar disease which they call *cremor*. The Germans, in different parts of the empire, are subject to different reigning diseases. In Westphalia, they are peculiarly troubled with peripneumonies and the itch. In Silesia, Franconia, Austria, and other places thereabout, they are very liable to fevers of the burning kind, to bleedings at the nose, and other hæmorrhages; and to the gout, inflammations, and consumptions. In Misnia they have purple fevers; and the children are peculiarly infested with worms. In Greece, Macedonia, and Thrace, there are very few diseases; but what they have are principally burning fevers and phrenzies. At Constantinople the plague always rages; and in the West Indian islands, malignant fevers, and the most terrible colics. These diseases are called *endemic*.

DISEASES of Horses. See FARRIERY.

DISEASES of Dogs. See DOGS.

DISEASES of Plants. See AGRICULTURE, no 69, et seq. and BLIGHT, MILDEW, &c.

DISEMBOGUE. When a ship passes out of the mouth of some great gulf or bay, they call it *disemboguing*. They say also of a river, that at such a place, or after it has run so many leagues, it disembogues itself into the sea.

DISFRANCHISING, among civilians, signifies the depriving a person of the rights and privileges of a free citizen or subject.

DISGUISE, a counterfeit habit. Persons doing unlawful acts in disguise are by our statutes sometimes subjected to great penalties, and even declared felons. Thus by an act, commonly called the *black act*, persons appearing disguised and armed in a forest or grounds inclosed, or hunting deer, or robbing a warren or a fish-pond, are declared felons.

DISH, in mining, is a trough made of wood, about 28 inches long, four inches deep, and six inches wide; by which all miners measure their ore. If any be taken selling their ore, not first measuring it by the bar-master's dish, and paying the king's duty, the seller forfeits his ore, and the buyer forfeits for every such offence 40 shillings to the lord of the field or farmer.

DISJUNCTIVE, something that separates or disjoins. Thus, *or, neither, &c.* which in connecting a

discourse yet separates the parts of it, are called *disjunctive conjunctions*.

DISK. See DISC.

DISLOCATION, the putting a bone out of joint by some violence, usually called by the physicians *luxation*.

DISMISSION of a BILL, in chancery. If the plaintiff does not attend on the day fixed for the hearing, his bill is dismissed with costs. It may be also dismissed for want of prosecution, which is in the nature of a non-suit at law, if he suffers three terms to elapse without moving forward in the cause.

DISMOUNTING, in the military art, the act of unhorsing. Thus, to dismount the cavalry, the dragoons, or the like, is to make them alight. To dismount the cannon, is to break their carriages, wheels, and axletrees, so as to render them unfit for service. Horses are also dismounted when they are rendered unfit for service.

DISPARAGEMENT, in law, is used for the matching an heir, &c. in marriage, below his or her degree or condition, or against the rules of decency. The word is a compound of the privative particle *dis*, and *par*, "equal."

DISPART, in gunnery, is the setting a mark upon the muzzle-ring, or thereabouts, of a piece of ordnance, so that a sight-line taken upon the top of the base-ring against the touch-hole, by the mark set on or near the muzzle, may be parallel to the axis of the concave cylinder. The common way of doing this, is to take the two diameters of the base ring, and of the place where the dispart is to stand, and divide the difference between them into two equal parts, one of which will be the length of the dispart which is set on the gun with wax or pitch, or fastened there with a piece of twine or marlin. By means of an instrument it may be done with all possible nicety.

DISPATCH, a letter on some affair of state, or other business of importance, sent with care and expedition, by a courier express. The business of dispatches lies on the secretaries of state and their clerks. The king gives directions to his ministers abroad by dispatches. The word is also used for the packet or mail containing such letters. The French, during the reign of Louis XIV. had a *conseil des depeches*, "council of dispatches," held in the king's presence, at which the dauphin, the duke of Orleans, the chancellor, and four secretaries of state, assisted.

DISPAUPER. A person suing *in forma pauperis*, is said to be dispaupered, if, before the suit is ended, he has any lands or other estate fallen to him, or if he has any thing to make him lose his privilege. See the article *FORMA Pauperis*.

DISPENSARY, or **DISPENSATORY,** denotes a book containing the method of preparing the various kinds of medicines used in pharmacy. Such are those of Bauderon, Quercetan, Zwelfer, Charas, Bates, Mesue, Salmon, Lemery, Quincy, &c. but the latest and most esteemed, beside the London and Edinburgh Pharmacopœias, is the Edinburgh New Dispensatory, being an improvement upon that of Dr Lewis's.

DISPENSARY, or *Dispensatory*, is likewise a magazine or office for selling medicines at prime cost to the poor. The college of physicians maintain three of these in London; one at the college itself in Warwick-lane;

Disk
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Dispensary.

Dispensation, Dispersion. lane; another in St Peter's alley, Cornhill; and a third in St Martin's lane. Dispensaries have also been established in several of the principal towns in Scotland and England; particularly in Edinburgh, Dundee, and Kelfo; as also at Newcastle upon Tyne.

DISPENSATION, in law, the granting a license of doing some certain action that otherwise is not permitted.

DISPERSION, in general, signifies the scattering or dissipating something. Hence

DISPERSION, in optics, the same with the divergency of the rays of light.

Point of DISPERSION, in dioptrics, the point from which refracted rays begin to diverge, where their refraction renders them divergent.

DISPERSION of Inflammation, in medicine and surgery, is the removing the inflammation, and restoring the inflamed part to its natural state.

DISPERSION of Mankind, in the history of the world, was occasioned by the confusion of tongues, and took place in consequence of the overthrow of Babel at the birth of Peleg; whence he derived his name: and it appears by the account given of his ancestors, Gen. chap. xi. 10—16, to have happened in the 101st year after the flood according to the Hebrew chronology, and by the Samaritan computation in the 401st. However, various difficulties have been suggested by chronologers concerning the true era of this event. Sir John Marsham and others, in order to reconcile the Hebrew and Egyptian chronologies, maintain a dispersion of mankind before the birth of Peleg. Others, unable to find numbers sufficient for the plantation of colonies in the space of 101 years, according to the Hebrew computation, fix the dispersion towards the end of Peleg's life, thus following the computation of the Jews. Petavius assigns the 153d year after the flood; Cumberland the 180th; and Usher, though he generally refers it to the time of Peleg's birth, in one place assigns the 131st after the flood for this event. Mr Shuckford supposes the dispersion to have been gradual, and to have commenced with the separation of some companies at the birth of Peleg, and to have been completed 31 years after. According to the calculation of Petavius, the number of inhabitants on the earth at the birth of Peleg amounted to 32,768: Cumberland makes them 30,000: Mr Mede states them at 7000 men, besides women and children: and Mr Whiston, who supposes that mankind now double themselves in 400 years, and that they doubled themselves between the deluge and the time of David in 60 years at a medium, when their lives were six or seven times as long as they have been since, by his computation produces about 2389; a number much too inconsiderable for the purposes of separating and forming distinct nations. This difficulty induced Mr Whiston to reject the Hebrew and to adopt the Samaritan chronology, as many others have done; which, by allowing an interval of 401 years between the flood and the birth of Peleg, furnishes, by the last mentioned mode of computation, more than 240,000 persons.

As to the manner of the dispersion of the posterity of Noah from the plain of Shinar, it was undoubtedly conducted with the utmost regularity and order. The sacred historian informs us, that they were divided in their lands; every one according to his tongue, ac-

cording to his family, and according to his nation, Dispersion. Gen. x. 5, 20, 31: and thus, as Mr Mede observes, they were ranged according to their nations, and every nation was ranged by their families; so that each nation had a separate lot, and each family in every nation. The following abstract will serve to give a general idea of their respective settlements: Japhet, Noah's eldest son, had seven sons; viz. Gomer, whose descendants inhabited those parts of Asia which lie upon the Ægean Sea and Hellespont northward, containing Phrygia, Pontus, Bithynia, and a great part of Galatia. The Galatians, according to Josephus, were called *Gomerai*; and the Cimmerii, according to Herodotus, occupied this tract of country: and from these Gomerians, Cimmerii, or Celts, Mr Camden derives our ancient Britons, who still retain the name *Cymro* or *Cymru*. Magog, the second son of Japhet, was probably the father of the Scythians on the east and north-east of the Euxine Sea. Madai planted Media, though Mr Mede assigns Macedonia to his share. Javan was the father of the Grecians about Ionia, whose country lies along upon the Mediterranean Sea; the radicals of Javan and Ionia being the same. To Tubal and Meshech belonged Cappadocia and the country which lies on the borders of the Euxine Sea; and from them, migrating over the Caucasus, it is supposed the Russians and Moscovites are descended. And Tiras occupied Thrace. The sons of Shem were five: Elam, whose country lay between the Medes and Mesopotamians, and was called by the Gentile writers *Elymais*; and Josephus calls the Elamites the founders of the Persians: Ashur, who was driven out of Shinar by Nimrod, afterwards settled in Assyria, and there built Nineveh and other cities: Arphaxad, who gave name to the country which Ptolemy calls *Arraphacitis*, a province of Assyria, though Josephus makes him the father of the Chaldees: Lud, who inhabited and gave name to the country of Lydia about the river Mæander, remarkable for its windings, in Asia Minor: and Aram, the father of the Syrians. Ham, the youngest son of Noah, had four sons; viz. Cush, whose posterity spread into the several parts of Arabia, over the borders of the land of Edom, into Arabia Felix, up to Midian and Egypt: Mizraim, the father of them who inhabited Egypt and other parts of Africa: Phut, to whom Bochart assigns the remaining part of Africa, from the lake Tritonides to the Atlantic Ocean, called *Lybia*: and Canaan, to whom belonged the land of Canaan, whence the Phœnicians derived their origin.

Dr Bryant has advanced a new hypothesis on this subject, and supported it with his usual acuteness and learning. He maintains, that the dispersion as well as the confusion of tongues was local, and limited to the inhabitants of the province of Babel; that the separation and distribution recorded to have taken place in the days of Peleg, Gen. x. 25, 31, 32, which was the result of Divine appointment, occasioned a general migration; and that all the families among the sons of men were concerned in it. The house of Shem, from which the Messiah was to spring, was particularly regarded in this distribution; the portion of his children was near the place of separation; they in general had Asia to their lot; as Japhet had Europe, and Ham the large continent of Africa. But the sons of Chus would not

Displayed
Disquisition.

submit to the divine dispensation; they went off under the conduct of Nimrod, and seem to have been for a long time in a roving state. However, at last they arrived at the plains of Shinar; and having ejected Ashur and his sons, who were placed there by Divine appointment, seized his dominions, and laid there the foundation of a great monarchy. But afterwards fearing lest they should be divided and scattered abroad, they built the tower of Babel as a landmark to which they might repair; and probably to answer the purposes of an idolatrous temple, or high altar, dedicated to the host of heaven, from which they were never long to be absent. They only, viz. the sons of Chus or the Cuthites, and their associates from other families, who had been guilty of rebellion against divine authority, and of wicked ambition and tyranny, were punished with the judgment of confounded speech through a failure in labial utterance, and of the dispersion recorded in Gen. x. 8, 9: in consequence of which they were scattered abroad from this city and tower, without any certain place of destination. The Cuthites invaded Egypt or the land of Mizraim in its infant state, seized the whole country, and held it for some ages in subjection; and they extended likewise to the Indies and Ganges, and still farther into China and Japan. From them the province of Cushan or Goshen in Egypt derived its name. Here they obtained the appellation of *royal shepherds*; and when they were by force driven out of the country, after having been in possession of it for 260 or 280 years, the land which they had been obliged to quit was given to the Israelites, who were also denominated *shepherds*, but should not be confounded with the former or the antecedent inhabitants of Goshen.

DISPLAYED, in heraldry, is understood of the position of an eagle, or any other bird, when it is erect, with its wings expanded or spread forth.

DISPONDEE, in the Greek and Latin poetry, a double spondee or foot, consisting of four long syllables; as *māēcēnātēs*, *cōnclūdētēs*.

DISPOSITION, in Scots law, is that deed or writing which contains the sale or grant of any subject: when applied to heritable subjects, it in some cases gets the name of *charter*, which differs from a disposition in nothing else than a few immaterial forms.

DISPOSITION, in architecture, the just placing the several parts of an edifice according to their nature and office. See ARCHITECTURE, n° 31, &c.

DISPOSITION, in oratory. See ORATORY, Part I.

DISPOSITION, in painting. See PAINTING.

DISPOSITION, in human nature.—In every man there is something original, that serves to distinguish him from others, that tends to form a character, and to make him meek or fiery, candid or deceitful, resolute or timorous, cheerful or morose. This original bent, termed *disposition*, must be distinguished from a *principle*: the latter, signifying a law of human nature, makes part of the common nature of man; the former makes part of the nature of this or that man. *Propensity* is a name common to both; for it signifies a principle as well as a disposition.

DISQUISITION (from *dis* and *quero* "I inquire"), an inquiry into the nature, kinds, and circumstances of any problem, question, or topic; in or-

der to gain a right notion of it, and to discourse clearly about it.

DISSECTION, in anatomy, the cutting up a body with a view of examining the structure and use of the parts. See ANATOMY.

Le Gendre observes, that the dissection of a human body, even dead, was held a sacrilege till the time of Francis I. And the same author assures us, he has seen a consultation held by the divines of Salamanca, at the request of Charles V. to settle the question whether or no it were lawful in point of conscience to dissect a human body in order to learn the structure thereof.

DISSEISIN, in law, an unlawful dispossessing a person of his lands or tenements.

DISSEPIMENTUM, in botany, the name by which Linnæus denominates the partitions which in dry seed-vessels, as capsules and pods (*siliqua*), divide the fruit internally into cells.

DISSENTERS, separatists from the service and worship of any established church.

DISSIDENTS, a denomination applied in Poland to those of the Lutheran, Calvinistic, and Greek profession. The king of Poland engages by the *pacta conventa* to tolerate them in the free exercise of their religion, but they have often had reason to complain of the violation of these promises. See (*History of*) POLAND.

DISSIMILITUDE, unlikeness or want of similitude. See the article RESEMBLANCE and *dissimilitude*.

DISSIMULATION, in morals, the act of dissembling, by fallacious appearances, or false pretensions.

Good princes regard dissimulation as a necessary vice; but tyrants consider it as a virtue.

It is apparent that secrecy is often necessary, to oppose those who may be willing to circumvent our lawful intentions. But the necessity of precaution would become very rare, were no enterprizes to be formed, but such as could be avowed openly. The frankness with which we could then act, would engage people in our interests. Marshal Biron would have saved his life, by dealing ingenuously with Henry IV.

With respect to dissimulation, three things are to be observed; 1. That the characters of those are not to be esteemed, who are reserved and cautious without distinction. 2. Not to make secrets of unimportant matters. 3. To conduct ourselves in such manner, as to have as few secrets as possible.

DISSIPATION, in physics, an insensible loss or consumption of the minute parts of the body; or that flux whereby they fly off, and are lost.

Circle of DISSIPATION, in optics, is used for that circular space upon the retina, which is taken up by one of the extreme pencils or rays issuing from an object.

DISSOLVENT, in general, whatever dissolves or reduces a solid body into such minute parts as to be sustained in a fluid.

The principal dissolvents for metals are aqua-regia and aqua-fortis; for salts, earths, and gums, water; for coral, and other alkaline substances, distilled vinegar or spirits of wine. Dissolvents are the same with what the chemists call *menstruums*. See the article MENSTRUUM.

Dissection
Dissolvent.

Diffolvent,
Dissolution.

Universal DISSOLVENT. See the article ALKAHEST.

DISSOLUTION, in physics: a discontinuation, or analysis, of the structure of a mixed body; whereby, what was one, and contiguous, is divided into little parts, either homogeneous or heterogeneous.

Dissolution, then, is a general name for all reductions of concrete bodies into their smallest parts, without any regard either to solidity or fluidity: though in the usual acceptation of the word among authors, it is restrained to the reduction of solid bodies into a state of fluidity; which is more properly expressed by *solution*, as a branch of *dissolution*.

According to the opinion of Fr. Tertius de Lanis, Boerhaave, and some other learned men, the power or faculty of dissolving is lodged in fire alone. See FIRE and HEAT.

According to this hypothesis, other fluids commonly supposed dissolvents, only produce their effect by means of the fiery spicula they abound with; and even air, which is judged a powerful menstruum, owes all its force to the rays of light diffused therein.

Sir Isaac Newton accounts for all dissolutions, and the several phenomena thereof, from the great principle of attraction; and, in effect, the phenomena of dissolution furnish a great part of the arguments and considerations whereby he proves the reality of that principle. The following is a specimen of that great author's way of philosophising on the subject of dissolution.

"When salt of tartar dissolves by lying in a moist place, is not this done by an attraction between the particles of the salt of tartar and those of the water which float in the air in form of vapours? and why does not common salt, or salt-petre, or vitriol, do the like, but for want of such an attraction? And when aqua-fortis, or spirit of vitriol, poured on steel-filings, dissolves the filings with a great heat and ebullition; is not this heat and ebullition effected by a violent motion of the parts? and does not that motion argue, that the acid parts of the liquor rush towards the parts of the metal with violence, and run forcibly into its pores; till, getting between the utmost particles and the main mass of metal, they loosen them therefrom, and set them at liberty to float off into the water? When a solution of iron in aqua-fortis dissolves lapis calaminaris, and lets go the iron; or a solution of copper dissolves iron immersed in it, and lets go the copper; or a solution of mercury in aqua-fortis poured on iron, copper, tin, or lead, dissolves the metal, and lets go the mercury; does not this argue, that the acid particles of the aqua-fortis are attracted more strongly by the lapis calaminaris than by iron; by iron than by copper; by copper than by silver; and by iron, copper, tin, and lead, than by mercury? And is it not for the same reason, that iron requires more aqua-fortis to dissolve it than copper, and copper more than the other metals; and that of all metals iron is dissolved most easily, and is most apt to rust; and next after iron, copper? When aqua-fortis dissolves silver, and not gold; and aqua-regia dissolves gold, and not silver; may it not be said, that aqua-fortis is subtle enough to penetrate the pores of gold as well as of silver, but wants the attractive force to give it entrance; and the same of aqua-regia and silver? And when metals are dissolved in acid menstrooms, and the acids in conjunction with the metal

act after a different manner, so as that the taste of the compound is milder than that of the simples and sometimes a sweet one; is it not because the acids adhere to the metallic particles, and thereby lose much of their activity? And if the acid be in too small a proportion to make the compound dissoluble in water; will it not, by adhering strongly to the metal, become unactive, and lose its taste, and the compound become a tasteless earth? for such things as are not dissoluble by the moisture of the tongue are insipid."

Dr Freind gives us a mechanical account of dissolution, in the instance of salt dissolved in water, which is the most simple operation that falls under this head. This motion he ascribes to that attractive force, which is so very extensive in natural philosophy, that there is no kind of matter but what is under its influence. It may be observed, says he, that the corpuscles of salts, which are the most simple of any, are withal very minute, and for their bulk very solid; and therefore exert a very strong attractive force, which, *ceteris paribus*, is proportional to the quantity of matter. Hence it comes to pass, that the particles of water are more strongly attracted by the saline particles than they are by one another: the particles of water, therefore, cohering but loosely, and being easily moveable, approach the corpuscles of salts, and run, as it were, into their embraces: and the motion of them is quicker or slower, according to their less or greater distances; the attractive force in all bodies being strongest, at the point of contact. Therefore, if salt be thrown into the middle of a dish full of water, we shall find the aqueous particles which are in the middle of the dish sharp and pungent to the taste, but the water upon the sides of the vessel almost insipid; so that, when such a motion once arises, the aqueous particles are carried with an equal force towards the salts, and the moment of them is to be estimated from the ratio of their weight and celerity conjunctly. By the force of this impulse, they open to themselves a passage into the pores of the salts, which are very numerous; and at length so break and divide their texture, that all cohesion of their parts is destroyed: hereupon, being separated, and removed to a convenient distance from one another, they are dispersed, and float here and there about the water.

The simple dissolution of saline substances of every kind in water, may indeed be plausibly enough explained on the hypothesis of attraction; but where the dissolution is attended with heat, the emission of vapour, &c. it seems necessary to seek for some other principle than mere attraction to solve these phenomena. When diluted oil of vitriol, for instance, is poured upon iron-filings, a great quantity of vapour arises, which, if it was attempted to be confined, would certainly break the containing vessel.—It is impossible to imagine any connection between attraction and the emission of a vapour; and what is still more unaccountable, this vapour is inflammable, though neither the oil of vitriol nor the iron are so by themselves. Another very strong objection against the hypothesis of attraction may be derived from the phenomena of metallic dissolutions in general; for they do not dissolve completely in acids, as salts do in water. By dissolution they are always decomposed, and cannot be recovered in their proper form without a good deal of trouble.

Dissolution.

Diffolution. trouble. One metal, indeed, will very often precipitate another from an acid in its metalline form; but this is attended with the decomposition of the second metal; so that this can by no means be reckoned a fair experiment. But, whatever other method is used, the dissolved metal is always recovered in form of an earthy powder, that we could scarcely imagine capable of ever becoming malleable, and assuming the splendid appearance of a metal. Now, if there was a strong attraction between this and the acid, we might very justly conjecture, that the dissolution happened by means of that attraction; but so far from this, after a metal has been dissolved by any acid, and the calx has been separated from it, it is always difficult, and very often impossible, to procure a dissolution of the calx in the same acid. The action of the acid in this case seems not unlike that of fire upon wood or any other inflammable substance. Dry wood, thrown into the fire, burns and flames with great violence; but the same wood reduced to ashes, instead of burning, extinguishes fire already kindled. In like manner, a piece of clear metal thrown into an acid, dissolves with great violence: but the same metal, deprived of its phlogistic principle, and reduced to a calx, cannot be acted upon by acids, in whatever manner they are applied; at least, not without the greatest difficulty; and the more perfect the calx is, *i. e.* the more completely it is deprived of its inflammable principle, the greater the difficulty is of combining it afterwards with an acid.

Another thing in which the dissolution of metals by an acid resembles the burning of combustibles by fire is, that in both cases there is a separation of the principle of inflammability. In the case of oil of vitriol and iron-silings, this is exceedingly obvious; for there the vapour which arises from the mixture takes fire, and explodes with great vehemence. In all other cases it is very easily proved; for the calx is always capable of being revived into metal by the addition of any substance containing phlogiston. The calces prepared by fire, and by precipitation from acids, also resemble one another so much, that in many cases they are scarce to be distinguished.

These considerations seem to favour the hypothesis of Dr Boerhaave; and much more does the following, namely, that almost all metallic solutions produce some degree of sensible heat. In some metals this is very considerable; but the greatest heat producible by an aqueous solution of any substance is by dissolving quicklime in the nitrous acid. The heat here greatly exceeds that of boiling water. In some dissolutions of inflammable matters by a mixture of the vitriolic and nitrous acids, the heat is so great, that the whole mixture takes fire almost instantaneously. Hence the Boerhaavians think they have sufficient grounds to conclude, that fire alone is the agent by which all dissolutions are performed.

These appearances have also been explained on the principles of attraction; and it has been said, that the heat, &c. were owing to nothing but the violent action of the particles of the acid and metal upon each other. But the late discoveries made by Dr Black, with regard to heat, show, that it is capable of remaining concealed in substances for any length of time, and af-

terwards breaking out in its proper form. It is probable, therefore, that the heat produced in these dissolutions is no other than what existed before, either in the acid or in the metal. But for a full discussion of this subject see the articles COLD, CONGELATION, EVAPORATION, FIRE, HEAT, &c.

DISSONANCE, in music. See DISCORD.

DISSYLLABLE, among grammarians, a word consisting only of two syllables: such are nature, science, &c.

DISTAFF, an instrument about which flax is tied in order to be spun.

DISTANCE, in general, an interval between two things, either with regard to time or place. See METAPHYSICS.

Accessible DISTANCES, in geometry, are such as may be measured by the chain, &c. See GEOMETRY.

Inaccessible DISTANCES, are such as cannot be measured by the chain, &c. by reason of some river, or the like, &c. which obstructs our passing from one object to another. See GEOMETRY.

DISTANCE, in astronomy. The distance of the sun, planets, and comets, is found only from their parallax, as it cannot be found either by eclipses or their different phases: for from the theory of the motions of the earth and planets we know, at any time, the proportion of the distances of the sun and planets from us; and the horizontal parallaxes are in a reciprocal proportion to these distances. See ASTRONOMY.

DISTASTE properly signifies an aversion or dislike to certain foods; and may be either constitutional, or owing to some disorder of the stomach.

DISTEMPER, among physicians, the same with DISEASE.

DISTEMPER, in painting, a term used for the working up of colours with something besides water or oil. If the colours are prepared with water, that kind of painting is called *limning*; and if with oil, it is called *painting in oil*, and simply *painting*. If the colours are mixed with size, whites of eggs, or any such proper glutinous or unctuous matter, and not with oil, then they say it is done in *distemper*.

DISTENSION, in general, signifies the stretching or extending a thing to its full length or breadth.

DISTICH, a couplet of verses making a complete sense. Thus hexameter and pentameter verses are disposed in distichs. There are excellent morals in Cato's distichs.

DISTICHIASIS, in surgery, a disease of the eyelids, when under the ordinary eye-lashes there grows another extraordinary row of hair, which frequently eradicates the former, and, pricking the membrane of the eye, excites pain, and brings on a defluxion.—It is cured by pulling out the second row of hairs with nippers, and cauterizing the pores out of which they issued.

DISTILLATION. See CHEMISTRY, *Index*.

The objects of distillation, considered as a trade distinct from the other branches of chemistry, are chiefly spirituous liquors, and those waters impregnated with the essential oil of plants, commonly called *simple distilled waters*. The distilling compound spirits and waters is reckoned a different branch of business, and they who deal in that way are commonly called *rectifiers*. This

Distillation. This difference, however, though it exists among commercial people, is not at all founded in the nature of the thing; compound spirits being made, and simple spirits being rectified, by the very same operations by which they are at first distilled, or at least with very trifling alterations.

²
Spirits perfectly flavourless, how obtained.

The great object with every distiller ought to be, to procure a spirit perfectly flavourless, or at least as well freed from any particular flavour as may be; and in this country the procuring of such a spirit is no easy matter. The only materials for distillation that have been used in large quantity, are malt and molasses or treacle. Both of these, especially the first, abound with an oily matter, which, rising along with the spirit, communicates a disagreeable flavour to it, and from which it can scarce be freed afterwards by any means whatever.—Some experiments have been made upon carrots, as a subject for the distillers: but these are not as yet sufficiently decisive; nor is it probable, that a spirit drawn from carrots would be at all devoid of flavour, more than one drawn from malt.—To dissipate the essential oil which gives the disagreeable flavour to malt spirits, it has been proposed to inspissate the wort into a rob, or thin extract like a syrup; afterwards to thin it with water, and ferment it in the usual manner. This certainly promises great success; there is no subject we know of that is possessed of any kind of essential oil, but what will part with it by distillation or by long boiling. The inspissating of the wort, however, does not seem to be either necessary or safe to be attempted; for, in this case, there is great danger of its contracting an empyreuma, which never could be remedied. The quantity lost by evaporation, therefore, might be occasionally added, with an equal certainty of dissipating the obnoxious oil. Whether the yield of spirit would be as great in this case as in the other, is a question that can by no means be discussed without further experiments. According to a theory adopted by some distillers, namely, that essential oils are convertible into ardent spirits; and that the more oily any subject is, the greater quantity of spirit is obtainable from it; the practice of dissipating the oil before fermentation must certainly be a loss. But we are too little acquainted with the composition of vinous spirits, to have any just foundation for adopting such theories. Besides, it is certain, that the quantity of ardent spirit producible from any substance, malt for instance, very greatly exceeds the quantity of essential oil which can by any means be obtained from the same; nor do we find that those substances, which abound most in essential oil, yield the greatest quantity of spirits. So far from this, fine sugar, which contains little or no essential oil, yields a great deal of ardent spirit.

³
Essential oil by some thought convertible into spirit.

⁴
Directions concerning fermentation.

Previous to the operation of distilling, those of brewing and fermentation are necessary: but as these are fully treated of under the article BREWING, we shall here only observe, that unless the boiling of the wort, before fermentation, is found to dissipate the essential oil, so as to take away the flavour of the malt, there is no necessity for being at the trouble of that operation. The wort may be immediately cooled and fermented.—The fermentation ought always to be carried on as slowly as possible, and performed in vessels closely stopped; only having at the bung a valve pressed down by a spring, which will yield with less force than is suffi-

cient to burst the vessel. It should even be suffered to remain till it has become perfectly fine and transparent; as by this means the spirit will not only be superior in quantity, but also in fragrance, pungency, and vinosity, to that commonly produced.

With regard to performing the operation of distilling, there is only one general rule that can be given, namely, to let the heat, in all cases, be as gentle as possible. Accidents will be effectually prevented by having the worm of a proper wideness, and by rectifying the spirits in a water-bath; which, if sufficiently large, will perform the operation with all the dispatch requisite for the most extensive business.—The vessel in which the rectification is performed, ought to be covered with water up to the neck, and to be loaded with lead at the bottom, so that it may sink in the water. Thus the operation will go on as quickly as if it was on an open fire, and without the least danger of a miscarriage; nor will it ever be necessary to make the water in the bath come to a boiling heat.

As the end of rectification is to make the spirit *clean* as well as *strong*, or to deprive it of the essential oil as well as the aqueous part, it will be proper to have regard to this even in the first distillation. For this purpose, the spirit, as it first comes over, should be received into a quantity of cold water; as by this means the connection betwixt it and the oily matter will be considerably lessened. For the same reason, after it has been once rectified in the water-bath, it should be again mixed with an equal quantity of water, and distilled a second time. Thus the spirit will be freed from most of the oily matter, even though it hath been very much impregnated with it at first. It is necessary to observe, however, that by using such a quantity of water, a considerable part of the water will be left in the residuum of each rectification. All these residuums, therefore, must be mixed together, and distilled on an open fire, with a brisk heat, that the remainder of the spirit may be got out.

After the spirit has been distilled once or twice in this manner from water, it may be distilled in a water-bath without any addition; and this last rectification will free it from most of the water it contains. But if it is required to be highly dephlegmated, a quantity of pure and dry salt of tartar must be added. The attraction betwixt this salt and water is greater than that betwixt water and spirit of wine. The salt therefore imbibes the water contained in the spirit, and sinks with it to the bottom. The spirit, by a single distillation, may then be rendered perfectly free from water; but there is great danger of some of the alkaline salt rising along with it, and impregnating it with what is called an *urinous flavour*. When this once happens, it is impossible to be remedied; and the only way to prevent it is, to make the heat with which the spirit is distilled as gentle as possible. It hath been proposed, indeed, to prevent the rising of any thing alkaline, by the admixture of some calcined vitriol, sal catharticus amarus, or other imperfect neutral salt; but this can scarce be supposed to answer any good purpose, as the alkali unites itself with the oily matter of the spirit, and forms a kind of saponaceous compound, which is not so easily affected by the acid of the vitriol or other salt, especially as these salts will not dissolve in the spirit itself.

Distillation.

7
Of imita-
ting foreign
spirits.8
Method of
making
brandies in
France.

One very great desideratum among the distillers of this country is, a method of imitating the foreign spirits, brandy, rum, gin, &c. to a tolerable degree of perfection; and notwithstanding the many attempts that are daily made for this purpose, the success in general hath been but very indifferent. On this subject, Mr Cooper hath the following observations, in his Complete System of Distillation; which, as they are applicable to all other spirits as well as brandy, we shall here transcribe.—“The general method of distilling brandies in France need not be formally described, as it differs in nothing from that practised here in working from malt-wash or molasses; nor are they in the least more cleanly or exact in the operation. They only observe more particularly to throw in a little of the natural ley into the still along with the wine, as finding this gives their spirit the flavour for which it is generally admired abroad.—But, though brandy is extracted from wine, experience tells us that there is a great difference in the grapes from which the wine is made. Every soil, every climate, every kind of grapes, varies with regard to the quantity and quality of the spirits extracted from them. There are some grapes which are only fit for eating; others for drying, as those of Damascus, Corinth, Provence, and Avignon, but not fit to make wine.—Some wines are very proper for distillation, and others much less so. The wines of Languedoc and Provence afford a great deal of brandy by distillation, when the operation is performed on them in their full strength. The Orleans wines, and those of Blois, afford yet more: but the best are those of the territories of Cogniac and Andaye; which are, however, in the number of those the least drunk in France. Whereas those of Burgundy and Champagne, though of a very fine flavour, are improper, because they yield but very little in distillation.

“It must also be farther observed, that all the wines for distillation, as those of Spain, the Canaries, of Alicante, of Cyprus, of St Peres, of Toquet, of Grave, of Hungary, and others of the same kind, yield very little brandy by distillation; and consequently would cost the distiller considerably more than he could sell it for. What is drawn from them is indeed very good, always retaining the saccharine quality and rich flavour of the wine from whence it is drawn; but as it grows old, this flavour often becomes aromatic, and is not agreeable to all palates.

“Hence we see that brandies always differ according as they are extracted from different species of grapes. Nor would there be so great a similarity as there is between the different kinds of French brandies, were the strongest wines used for this purpose: but this is rarely the case; the weakest and lowest flavoured wines only are distilled for their spirit, or such as prove absolutely unfit for any other use.

“A large quantity of brandy is distilled in France during the time of the vintage; for all those poor grapes that prove unfit for wine, are usually first gathered, pressed, their juice fermented; and directly distilled. This rids their hands of their poor wines at once, and leaves their casks empty for the reception of better. It is a general rule with them not to distil wine that will fetch any price as wine; for, in this state, the profits upon them are vastly greater than when re-

duced to brandies. This large stock of small wines, with which they are almost over-run in France, sufficiently accounts for their making such vast quantities of brandy in that country, more than in others which lie in warmer climates and are much better adapted to the production of grapes.—Nor is this the only fund of their brandies: for all the wine that turns eager, is also condemned to the still; and, in short, all that they can neither export nor consume at home, which amounts to a large quantity; since much of the wine laid in for their family provision is so poor as not to keep during the time of spending.

“Hence many of our English spirits, with proper management, are convertible into brandies that shall hardly be distinguished from the foreign in many respects, provided the operation be neatly performed.

“The common method of rectifying spirits from alkaline salts, destroys their vinosity, and in its stead introduces an urinous or lixivious taste. But as it is absolutely necessary to restore, or at least to substitute in its room, some degree of vinosity, several methods have been proposed, and a multitude of experiments performed, in order to discover this great desideratum. But none has succeeded equal to the spirit of nitre; and accordingly this spirit, either strong or dulcified, has been used by most distillers to give an agreeable vinosity to their spirits. Several difficulties, however, occur in the method of using it; the principal of which is, its being apt to quit the liquor in a short time, and consequently depriving the liquor of that vinosity it was intended to give. In order to remove this difficulty, and prevent the vinosity from quitting the goods, the dulcified spirit of nitre, which is much better than the strong spirit, should be prepared by a previous digestion, continued for some time, with alcohol; the longer the digestion is continued, the more intimately will they be blended, and the compound rendered the milder and softer.

After a proper digestion, the dulcified spirit should be mixed with the brandy, by which the vinosity will be intimately blended with the goods, and not disposed to fly off for a very considerable time.—No general rule can be given for the quantity of this mineral acid requisite to be employed; because different proportions of it are necessary in different spirits. It should, however, be carefully attended to, that though a small quantity of it will undoubtedly give an agreeable vinosity resembling that naturally found in the fine subtle spirits drawn from wines, yet an over large dose of it will not only cause a disagreeable flavour, but also render the whole design abortive, by discovering the imposition. Those, therefore, who endeavour to cover a foul taste in goods by large doses of dulcified spirit of nitre, will find themselves deceived.

“But the best, and indeed the only method of imitating French brandies to perfection, is by an essential oil of wine; this being the very thing that gives the French brandies their flavour. It must, however, be remembered, that, in order to use even this ingredient to advantage, a pure tasteless spirit must first be procured; for it is ridiculous to expect that this essential oil should be able to give the agreeable flavour of French brandies to our fulsome malt spirit, already loaded with its own nauseous oil, or strongly impregnated with a lixivious taste from the alkaline salts used

9
How brandy may be imitated in this country.

Distillation. in rectification. How a pure insipid spirit may be obtained, has already been considered; it only therefore remains to show the method of procuring this essential oil of wine, which is this:

"Take some cakes of dry wine-lees, such as are used by our hatters, dissolve them in six or eight times their weight of water, distil the liquor with a slow fire, and separate the oil with a separating glass; reserving for the nicest uses only that which comes over first, the succeeding oil being coarser and more resinous.—Having procured this fine oil of wine, it may be mixed into a quintessence with pure alcohol; by which means it may be preserved a long time fully possessed of all its flavour and virtues; but, without such management, it will soon grow resinous and rancid.

"When a fine essential oil of wine is thus procured, and also a pure and insipid spirit, French brandies may be imitated to perfection, with regard to the flavour. It must, however, be remembered, and carefully adverted to, that the essential oil be drawn from the same kind of lees as the brandy to be imitated was procured from; we mean, in order to imitate Coniac brandy, it will be necessary to distil the essential oil from Coniac lees; and the same for any other kind of brandy. For, as different brandies have different flavours, and as these flavours are entirely owing to the essential oil of the grape, it would be preposterous to endeavour to imitate the flavour of Coniac brandy with an essential oil procured from the lees of Bourdeaux wine.—When the flavour of the brandy is well imitated by a proper dose of the essential oil, and the whole reduced into one simple and homogeneous fluid, other difficulties are still behind: The flavour, though the essential part, is not, however, the only one; the colour, the proof, and the softness, must also be regarded, before a spirit that perfectly resembles brandy can be procured. With regard to the proof, it may be easily hit, by using a spirit rectified above proof; which, after being intimately mixed with the essential oil of wine, may be let down to a proper standard with fair water. And the softness may, in a great measure, be obtained by distilling and rectifying the spirit with a gentle fire; and what is wanting of this criterion in the liquor when first made, will be supplied by time: for it must be remembered, that it is time alone that gives this property to French brandies; they being at first acrid, foul, and fiery. But, with regard to the colour, a particular method is required to imitate it to perfection.

10
Spirits how
coloured.

"The art of colouring spirits owes its rise to observations on foreign brandies. A piece of French brandy that has acquired by age a great degree of softness and ripeness, is observed at the same time to have acquired a yellowish brown colour; and hence our distillers have endeavoured to imitate this colour in such spirits as are intended to pass for French brandy. And in order to this, a great variety of experiments have been made on different substances. But in order to know a direct and sure method of imitating this colour to perfection, it is necessary we should be informed whence the French brandies themselves acquire their colour. This discovery is very easily made. The common experiment of trying whether brandy will turn blackish with a solution of iron, shows that the colour is owing to some of the resinous matter of the oak-cask dissolved in the spirit. There can be no difficulty, therefore, in

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imitating this colour to perfection. A small quantity of the extract of oak, or the shavings of that wood, properly digested, will furnish us with a tincture capable of giving the spirit any degree of colour required. But it must be remembered, that as the tincture is extracted from the cask by brandy, that is, alcohol and water, it is necessary to use both in extracting the tincture; for each of these dissolves different parts of the wood. Let, therefore, a sufficient quantity of oak shavings be digested in strong spirit of wine, and also at the same time other oak-shavings be digested in water; and when the liquors have acquired a strong tincture from the oak, let both be poured off from the shavings into different vessels, and both placed over a gentle fire till reduced to the consistence of treacle. In this condition let the two extracts be intimately mixed together; which may be effectually done by adding a small quantity of loaf-sugar, in fine powder, and rubbing the whole well together. By this means a liquid essential extract of oak will be procured, and always ready to be used as occasion shall require.

"There are other methods in use for colouring brandies; but the best, besides the extract of oak above mentioned, are treacle and burnt sugar. The treacle gives the spirit a fine colour, nearly resembling that of French brandy; but as its colour is dilute, a large quantity must be used: this is not, however, attended with any bad consequences; for notwithstanding the spirit is really weakened by this addition, yet the bubble proof, the general criterion of spirits, is greatly mended by the tenacity imparted to the liquor by the treacle. The spirit also acquires from the mixture a sweetish or luscious taste, and a fullness in the mouth; both which properties render it very agreeable to the palates of the common people, who are in fact the principal consumers of these spirits. A much smaller quantity of burnt sugar than of treacle will be sufficient for colouring the same quantity of spirits: the taste is also very different; for instead of the sweetness imparted by the treacle, the spirit acquires from the burnt sugar an agreeable bitterness, and by that means recommends itself to nicer palates, which are offended with a luscious spirit. The burnt sugar is prepared by dissolving a proper quantity of sugar in a little water, and scorching it over the fire till it acquires a black colour. Either treacle or burnt sugar will nearly imitate the genuine colour of old French brandy; but neither of them will succeed when put to the test of the vitriolic solution.

"The spirit distilled from molasses or treacle is very clean or pure. It is made from common treacle dissolved in water, and fermented in the same manner as the wash for the common malt spirit. But if some particular art is not used in distilling this spirit, it will not prove so vinous as malt spirit, but more flat and less pungent and acid, though otherwise much cleaner tasted, as its essential oil is of a much less offensive flavour. Therefore, if good fresh wine lees, abounding in tartar, be added and duly fermented with the molasses, the spirit will acquire a much greater vinosity and briskness, and approach much nearer to the nature of foreign spirits. Where the molasses spirit is brought to the common proof-strength, if it is found not to have a sufficient vinosity, it will be very proper to add some good dulcified spirit of nitre; and if the spirit be clean

H

worked,

Distillation. worked, it may, by this addition only, be made to pass on ordinary judges for French brandy. Great quantities of this spirit are used in adulterating foreign brandy, rum, and arrack. Much of it is also used alone in making cherry-brandy and other drams by infusion; in all which many, and perhaps with justice, prefer it to foreign brandies. Molasses, like all other spirits, is entirely colourless when first extracted; but distillers always give it as nearly as possible the colour of foreign spirits."

11
Rum how
imitated.

If these principles hold good, the imitation of foreign spirits of all kinds must be an easy matter. It will only cost the procuring of some of those substances from which the spirit is drawn; and distilling this with water, the essential oil will always give the flavour desired. Thus, to imitate Jamaica rum, it will only be necessary to procure some of the tops, or other useless parts, of the sugar-canes; from which an essential oil being drawn, and mixed with clean molasses spirit, will give it the true flavour. The principal difficulty must lie in procuring a spirit totally, or nearly, free of all flavour of its own. The spirit drawn from the refuse of a sugar-house is by our author commended as superior to that drawn from molasses: though even this is not entirely devoid of some kind of flavour of its own; nor indeed is that drawn from the best refined sugar entirely flavourless. It is very probable, therefore, that to procure an absolutely flavourless spirit is impossible. The only method, therefore, of imitating foreign spirits is, by choosing such materials as will yield a spirit

12
Raisins the
best mate-
rial for pro-
curing
pure spirit.

flavoured as much like them as possible. The materials most recommended by our author in this case, and probably the best that can be used, are raisins. Concerning these he gives the following directions: "In order to extract this spirit, the raisins must be infused in a proper quantity of water, and fermented in the manner already directed. When the fermentation is completed, the whole is to be thrown into the still, and the spirit extracted by a strong fire. The reason why we here direct a strong fire is, because by that means a greater quantity of the essential oil will come over the helm with the spirit, which will render it fitter for the distiller's purpose: for this spirit is commonly used to mix with common malt goods: and it is surprising how far it will go in this respect, ten gallons of it being often sufficient to give a determining flavour and agreeable vinosity to a whole piece of malt spirits. It is therefore well worth the distiller's while to endeavour at improving the common method of extracting spirits from raisins; and perhaps the following hint may merit attention. When the fermentation is completed, and the still charged with fermented liquor as above directed, let the whole be drawn off with as brisk a fire as possible; but, instead of the cask or can generally used by distillers for a receiver, let a large glass, called by chemists a *separating glass*, be placed under the nose of the worm, and a common receiver applied to the spout of the separating glass: by this means the essential oil will swim upon the top of the spirit, or rather low wine, in the separating glass, and may be easily preserved at the end of the operation. The use of this limpid essential oil is well known to distillers; for in this resides the whole flavour, and consequently may be used to the greatest advantage in giving that distinguishing taste and true vinosity to the

common malt spirits. After the oil is separated from the low-wine, the liquor may be rectified in *balneo marie* into a pure and almost tasteless spirit, and therefore well adapted to make the finest compound cordials, or to imitate or mix with the finest French brandies, arracks, &c. In the same manner a spirit may be obtained from cyder. But as its particular flavour is not so desirable as that obtained from raisins, it should be distilled in a more gentle manner, and carefully rectified according to the directions we have already given."

These directions may suffice for the distillation of any kind of simple spirits. The distillation of compound ones depends on the observation of the following general rules, which are very easy to be learned and practised.

13
Directions
for distilling
compound
spirits.

1. The artist must always be careful to use a well cleansed spirit, or one freed from its own essential oil. For, as a compound water is nothing more than a spirit impregnated with the essential oil of the ingredients, it is necessary that the spirit should have deposited its own.
2. Let the time of previous digestion be proportioned to the tenacity of the ingredients, or the ponderosity of their oil.
3. Let the strength of the fire also be proportioned to the ponderosity of the oil intended to be raised with the spirit.
4. Let only a due proportion of the finest parts of the essential oil be united with the spirit; the grosser and less fragrant parts of the oil not giving the spirit so agreeable a flavour, and at the same time rendering it unsightly. This may in a great measure be effected by leaving out the faints, and making up to proof with fine soft water in their stead.

A careful observation of these four rules will render this part of distillation much more perfect than it is at present. Nor will there be any occasion for the use of burnt alum, white of eggs, isinglass, &c. to fine down cordial waters; for they will presently be fine, sweet and pleasant tasted, without any further trouble. We shall now subjoin particular receipts for making some of those compound waters, or spirits, that are most commonly to be met with, and are in the most general estimation.

Strong Cinnamon-water. Take eight pounds of fine cinnamon bruised, 17 gallons of clean rectified spirit, and two gallons of water. Put them into your still, and digest them 24 hours with a gentle heat; after which draw off 16 gallons with a pretty strong heat. — A cheaper spirit, but of an inferior quality, may be obtained by using cassia lignea instead of cinnamon. If you would dulcify your cinnamon water, take double-refined sugar in what quantity you please; the general proportion is about two pounds to a gallon; and dissolve it in the spirit, after you have made it up proof with clean water. One general caution is here necessary to be added; namely, that near the end of the operation, you carefully watch the spirit as it runs into the receiver; in order to prevent the faints from mixing with the goods. This you may discover by often catching some of it as it runs from the worm in a glass, and observing whether it is fine and transparent; for as soon as ever the faints begin to rise, the spirit will have an azure or bluish cast. As soon as this alteration

14
Receipts for
a number of
compound
spirits.

tion.

Distillation. tion in colour is perceived, the receiver must be immediately changed; for if the faints are suffered to mix themselves with the rest, the value of the goods will be greatly lessened.—Here we may observe, that the distillers call such goods as are made up proof, *double goods*; and those below proof, *single*.

Clove-water. Take of cloves bruised, four pounds; pimento, or all-spice, half a pound; proof-spirit, 16 gallons. Digest the mixture 12 hours in a gentle heat, and then draw off 15 gallons with a pretty brisk fire. The water may be coloured red, either by a strong tincture of cochineal, alkanet, or corn-poppy flowers. It may be dulcified at pleasure with double refined sugar.

Lemon-water. Take of dried lemon-peel, four pounds; clean proof spirit 10 gallons and a half, and one gallon of water. Draw off 10 gallons by a gentle fire, and dulcify with fine sugar.

Citron-water. Take of dry yellow rhinds of citrons, three pounds; of orange-peel, two pounds; nutmegs bruised, three quarters of a pound; clean proof-spirit, ten gallons and a half; water, one gallon: digest with a gentle heat; then draw off ten gallons in balneo marie, and dulcify with fine sugar.

Aniseed-water. Take of aniseed bruised, two pounds; proof-spirit, 12 gallons and a half; water, one gallon: draw off ten gallons with a moderate fire.—This water should never be reduced below proof; because the large quantity of oil with which it is impregnated, will render the goods milky and foul when brought down below proof. But if there is a necessity for doing this, their transparency may be restored by filtration.

Orange-water. Take of the yellow part of fresh orange-peel, five pounds; clean proof-spirit, ten gallons and a half; water, two gallons: draw off ten gallons with a gentle fire.

Cedrat-water. The cedrat is a species of citron, and very highly esteemed in Italy where it grows naturally. The fruit is difficult to be procured in this country; but as the essential oil is often imported from Italy, it may be made with it according to the following receipt.—Take of the finest loaf-sugar reduced to powder, a quarter of a pound; put it into a glass mortar, with 120 drops of the essence of cedrat; rub them together with a glass pestle; and put them into a glass alembic, with a gallon of fine proof-spirits and a quart of water. Place the alembic in balneo marie, and draw off one gallon, or till the faints begin to rise; and dulcify with fine sugar. This is reckoned the finest cordial yet known; it will therefore be necessary to be particularly careful that the spirit is perfectly clean, and, as much as possible, freed from any flavour of its own.

Orange Cordial-water, or Eau de Bigarade. Take the outer or yellow part of the peels of 14 bigarades, (a kind of oranges); half an ounce of nutmegs, a quarter of an ounce of mace, a gallon of fine proof-spirit, and two quarts of water. Digest all these together two days in a close vessel; after which draw off a gallon with a gentle fire, and dulcify with fine sugar. This cordial is greatly esteemed abroad, but is not so well known in this country.

Ros Solis. Take of the herb called *Ros Solis*, picked

clean, four pounds; cinnamon, cloves, and nutmegs, of each three ounces and a half; marigold flowers, one pound; caraway-seeds, ten ounces; proof-spirit, ten gallons; water, three gallons. Distil with a pretty strong fire, till the faints begin to rise. Then take of liquorice-root sliced, half a pound; raisins stoned, two pounds; red faunders, half a pound: digest these three days in two quarts of water; then strain out the clear liquor, in which dissolve three pounds of fine sugar, and mix it with the spirit drawn by distillation.

Uisquebaugh. Take nutmegs, cloves, and cinnamon, of each two ounces; the seeds of anise, caraway, and coriander, of each four ounces; of liquorice-root sliced, half a pound. Bruise the seeds and spices; and put them, together with the liquorice, into the still with 11 gallons of proof-spirits, and two gallons of water. Distil with a pretty brisk fire till the faints begin to rise. But, as soon as the still begins to work, fasten to the nose of the worm two ounces of English saffron tied up in a cloth, that the liquor may run thro' it, and extract all its tincture; and in order to this, you should frequently press the saffron with your fingers. When the operation is finished, dulcify your goods with fine sugar.

Ratafia. Is a liquor prepared from different kinds of fruits, and is of different colours according to the fruits made use of. Of red ratafia there are three kinds, the fine, the dry or sharp, and the common. The fruits most proper for making red ratafia, are the black heart-cherry, the common red cherry, the black cherry, the mery or honey cherry, the strawberry, the raspberry, the red gooseberry, and the mulberry. These fruits should be gathered when in their greatest perfection, and the largest and most beautiful of them chosen for the purpose.—The following is a receipt for making red ratafia, fine and soft. Take of the black heart-cherries 24 pounds; black cherries, four pounds; raspberries and strawberries, of each three pounds. Pick the fruits from their stalks, and bruise them; in which state let them continue 12 hours: press out the juice; and to every pint of it add a quarter of a pound of sugar. When the sugar is dissolved, run the whole through the filtering bag, and add to it three quarts of clean proof-spirits. Then take of cinnamon, four ounces; of mace, one ounce; and of cloves, two drams. Bruise these spices; put them into an alembic with a gallon of clean proof-spirits and two quarts of water, and draw off a gallon with a brisk fire. Add as much of this spicy spirit to your ratafia as will render it agreeable to your palate; about one fourth is the usual proportion.

Ratafia made according to the above receipt will be of a very rich flavour and elegant colour. It may be rendered more or less of a spicy flavour, by adding or diminishing the quantity of spirit distilled from the spices.—Some, in making ratafia, suffer the expressed juices of their fruits to ferment several days: by this means the vinosity of the ratafia is increased; but, at the same time, the elegant flavour of the fruits is greatly diminished. Therefore, if the ratafia is desired stronger or more vinous, it may be done by adding more spirits to the expressed juice; by which means the flavour of the fruits may be preserved, as well as the ratafia rendered stronger. It is also a method with some to tie the spices in a linen bag, and suspend them in the ratafia.

Distillation. *rafia.* But if this method is taken, it will be necessary to augment the quantity of spirit first added to the expressed juice. There is no great difference in the two methods of adding the spices, except that by suspending them in the *rafia* the liquor is rendered less transparent.

Dry or sharp Rafia. Take cherries and gooseberries, of each 30 pounds; mulberries, seven pounds; raspberries, ten pounds. Pick all these fruits clean from their stalks, &c. bruise them, and let them stand 12 hours; but do not suffer them to ferment. Press out the juice, and to every pint add three ounces of sugar. When the sugar is dissolved, run it through the filtering bag, and to every five pints of liquor add four pints of clean proof-spirit; together with the same proportion of spirit drawn from the spices in the foregoing composition.

Common Rafia. Take of nutmegs, eight ounces; bitter almonds, ten pounds; Lisbon sugar, eight pounds; ambergrease, ten grains: infuse these ingredients three days in ten gallons of clean proof-spirit, and filter thro' a flannel bag for use. The nutmegs and bitter almonds must be bruised, and the ambergrease rubbed with the Lisbon sugar in a marble mortar, before they are infused in the spirit.

Gold Cordial. Take of the roots of angelica, four pounds; raisins stoned, two pounds; coriander seeds, half a pound; caraway-seeds and cinnamon, of each half a pound; cloves, two ounces; figs and liquorice-root, of each one pound; proof-spirit, eleven gallons; water, two gallons. The angelica, liquorice, and figs, must be sliced before they are added. Digest two days; and draw off by a gentle heat till the faints begin to rise; hanging in a piece of linen, fastened to the mouth of the worm, an ounce of English saffron. Then dissolve eight pounds of sugar in three quarts of rose-water, and add to it the distilled liquor.—This liquor derives its name of *Gold Cordial*, from a quantity of leaf-gold being formerly added to it; but this is now generally disused, as it cannot possibly add any virtue.

Cardamum, or All-fours. Take of pimento, caraway, and coriander seeds, and lemon-peel, each three pounds; of malt spirits, eleven gallons; water, three gallons. Draw off with a gentle fire, dulcify with common sugar, and make up to the strength desired with clear water.—This is a dram greatly used by the poorer sort of people in some countries.

Geneva. There was formerly sold in the apothecaries shops a distilled spirituous water of juniper; but the vulgar being fond of it as a dram, the distillers supplanted the apothecaries, and sold it under the name of *Geneva*. The common kind, however, is not made from juniper-berries, but from oil of turpentine; and indeed it is surprising, that people should accustom themselves to drink such liquors for pleasure.—The receipt for making this kind of spirit, sold in the gin-shops at London, is as follows. Take of the ordinary malt spirits, ten gallons; oil of turpentine, two ounces; bay-salt, three handfuls. Draw off by a gentle fire till the faints begin to rise; and make up your goods to the strength required with clear water.

The best kind is made by the following recipe.—Take of juniper-berries, three pounds; proof-spirit, ten gallons; water, four gallons: Draw off by a gentle

fire till the faints begin to rise, and make up your goods to the strength required with clean water.

There is a sort of this liquor called *Hollands Geneva*, from its being imported from Holland, which is greatly esteemed.—The ingredients used by the Dutch are the same with those given in the last recipe; only, instead of malt-spirits, they use French brandy. But from what has been already observed concerning the nature of these kind of spirits, it is easy to see, that by the help of a well rectified spirit, *geneva* may be made in this country at least nearly equal to the Dutch, provided it is kept to a proper age; for all spirituous liquors contract a softness and mellowness by age, impossible to be imitated any other way.

DISTILLERY, the art of distilling brandy and other spirits. This art was first brought into Europe by the Moors of Spain, about the year 1150: they learned it of the African Moors, who had it from the Egyptians: and the Egyptians are said to have practised it in the reign of the emperor Dioclesian, though it was unknown to the ancient Greeks and Romans. See **DISTILLATION**, and **FERMENTATION**.

DISTINCTION, in logic, is an assemblage of two or more words, whereby disparate things, or their conceptions, are denoted.

DISTORTION, in medicine, is when any part of the human body remarkably deviates from its natural shape or position. Distortions of different parts may arise either from a convulsion or palsy; though sometimes a terrible distortion in the shape of the whole body hath arisen merely from carelessness and ill habits. Mr Winslow, in the *Memoirs of the Academy of Sciences at Paris*, gives a very remarkable account of a lady of quality, whom he had known to be perfectly straight for several years; but who taking afterwards to a sedentary course of life, got a custom of dressing herself very carelessly, and of leaning as she sat, either forwards or to a side. It was not many months before she found it painful and troublesome to stand or sit upright; and soon afterwards she found an inequality in the lower part of the back-bone. Alarmed at this, she consulted the gentleman who gave the account. To prevent the increase of the malady, he ordered her to wear a particular sort of jumps instead of stays, and had a pad of a proper size applied: but this was soon neglected; and the consequence was, that in a little time the back-bone became more and more crooked, and at length bent itself sidewise in two contrary directions, so as to represent the figure of the Roman S; and the lady, still refusing to take the proper measures, lost a fourth part of her height; and continued for the remainder of her life, not only crooked from right to left and from left to right, but so oddly folded together, that the first of the false ribs on one side approached very near the crest of the os ilium on that side, and the viscera of the lower belly became strangely pushed out of their regular places to the opposite side; and the stomach itself was so strongly compressed, that whatever she swallowed seemed to her to fall into two separate cavities.

DISTRESS, in its ordinary acceptation, denotes calamity, misery, or painful suffering.

The Contemplation of DISTRESS, a source of pleasure. On this subject we have a very pleasing and ingenious essay by Dr Barnes, in the *Memoirs of the Literary and*

Distillery
Distress.

Distress. and Philosophical Society of Manchester *. It is introduced with the following motto :

* Vol. I.
p. 144, &c.

*Suave mari magno, turbantibus æquora ventis,
E terrâ alterius magnum spectare periculum.
Non quia vexari quæquam est jucunda voluptas;
Sed quibus ipse malis careas, quia cernere suave est.*

LUCRETIVS.

"The pleasure here described by the poet, and of which he has mentioned so striking and apposite an instance, may perhaps at first seem of so singular and astonishing a nature, that some may be disposed to doubt of its existence. But that it does exist, in the case here referred to, and in many others of a similar kind, is an undoubted fact; and it may not appear an useless or disagreeable entertainment, to trace its source in the human breast, together with the final cause for which it was implanted there by our benevolent Creator.

"Shall I, it may be said, feel complacency in beholding a scene in which many of my fellow-creatures are agonizing with terror, whilst I can neither diminish their danger, nor, by my sympathy, divide their anguish? At the sight of another's wo, does not my bosom naturally feel pain? Do I not share in his sensations? And is not this strong and exquisite sensibility intended by my Maker to urge me on to active and immediate assistance? These sensations are indeed attended with a noble pleasure, when I can, by friendly attention, or by benevolent communication, soothe the sorrows of the poor mourner, snatch him from impending danger, or supply his pressing wants. But in general, where my sympathy is of no avail to the wretched sufferer, I fly from the spectacle of his misery, unable or unwilling to endure a pain which is not allayed by the sweet satisfaction of doing good."

It will be necessary, in answer to these objections, in the first place to prove the reality of the feeling, the cause of which, in the human constitution, we here attempt to explore.

Mr Addison, in his beautiful papers on the Pleasures of the Imagination, has observed, "that objects or scenes, which, when real, give disgust or pain, in description often become beautiful and agreeable. Thus, even a dunghill may, by the charms of poetic imagery, excite pleasure and entertainment. Scenes of this nature, dignified by apt and striking description, we regard with something of the same feelings with which we look upon a dead monster.

*Informe cadaver
Protrahitur: nequeunt expleri corda tuendo
Terribiles oculos, vultum, villosaque setis
Pectora semiferi, atque extinctos faucibus ignes.* VIRGIL.

"This (he observes) is more particularly the case, where the description raises a ferment in the mind and works with violence upon the passions. One would wonder (adds he) how it comes to pass, that passions, which are very unpleasant at all other times, are very agreeable when excited by proper description; such as terror, dejection, grief, &c. This pleasure arises from the reflection we make upon ourselves, whilst reading it, that we are not in danger from them. When we read of wounds, death, &c. our pleasure does not rise so properly from the grief which these melancholy descriptions give us, as from the secret comparison we make of ourselves with those who suffer. We should

Distress. not feel the same kind of pleasure, if we actually saw a person lying under the tortures that we meet with in a description."

And yet, upon the principle assigned by this amiable writer, we might feel the same, or even higher pleasure, from the actual view of distress, than from any description; because the comparison of ourselves with the sufferer would be more vivid, and consequently the feeling more intense. We would only observe, that the cause which he assigns for this pleasure is the very same with that assigned by Lucretius in our motto. Mr Addison applies it to the description; the poet, to the actual contemplation of affecting scenes. In both the pleasure is supposed to originate in selfishness. But wherever the social passions are deeply interested, as they are here supposed to be, from the pathetic description, or the still more pathetic survey, of the sufferings of another, the sympathetic feelings will of themselves, at once, and previously to all reflection, become a source of agreeable and tender emotions. They will thus dignify and enhance the satisfaction, if any such be felt, arising merely from the consideration of our own personal security. And the more entirely we enter into the scene, by losing all ideas of its being either past or fabulous, the more perfectly we forget ourselves, and are absorbed in the feeling,—the more exquisite is the sensation.

But as our subsequent speculations will chiefly turn upon the pleasure derived from real scenes of calamity, and not from those which are imaginary, it may be expected that we produce instances in proof that such pleasure is felt by persons very different in their taste and mental cultivation.

We shall not mention the horrid joy with which the savage feasts his eye upon the agonies and contortions of his expiring prisoner—expiring in all the pains which artificial cruelty can inflict! Nor will we recur to the almost equally savage sons of ancient Rome, when the majesty of the Roman people could rush, with eagerness and transport, to behold hundreds of gladiators contending in fatal conflict, and probably more than half the number extended, weltering in blood and writhing in agony, upon the plain. Nor will we mention the Spanish bull-feasts; nor the fervent acclamations of an English mob around their fellow-creatures, when engaged in furious battle, in which it is possible that some of the combatants may receive a mortal blow, and be hurried in this awful state to the bar of his Judge. Let us survey the multitudes which, in every part of the kingdom, always attend an execution. It may perhaps be said, that in all places the vulgar have little of the sensibility and tenderness of more polished bosoms. But, in the last mentioned instance, an execution, there is no exultation in the sufferings of the poor criminal. He is regarded by every eye with the most melting compassion. The whole assembly sympathizes with him in his unhappy situation. An awful stillness prevails at the dreadful moment. Many are wrung with unutterable sensations; and prayer and silence declare, more loudly than any language could, the interest they feel in his distress. Should a reprieve come to rescue him from death, how great is the general triumph and congratulation! And probably in this multitude you will find not the mere vulgar herd alone, but the man of superior knowledge and of more refined sensibility.

Distress. sensibility; who, led by some strong principle, which we wish to explain, feels a pleasure greater than all the pain, great and exquisite as one should imagine it to be, from such a spectacle.

The man who condemns many of the scenes we have already mentioned as barbarous and shocking, would probably run with the greatest eagerness to some high cliff, overhanging the ocean, to see it swelled into a tempest, though a poor vessel, or even a fleet of vessels, were to appear as one part of the dreadful scenery, now lifted to the heavens on the foaming surge, now plunged deep into the fathomless abyss, and now dashed upon the rocks, where they are in a moment shivered into fragments, and, with all their mariners, entombed in the wave. Or, to vary the question a little; Who would not be forward to stand safe, on the top of some mountain or tower, adjoining to a field of battle, in which two armies meet in desperate conflict, though probably thousands may soon lie before him prostrate on the ground, and the whole field present the most horrid scenes of carnage and desolation?

That in all these cases pleasure predominates in the compounded feeling, is plain from hence, because you continue to survey the scene; whereas when pain became the stronger sensation, you would certainly retire.

Cultivation may indeed have produced some minuter differences in the taste and feelings of different minds. Those whose sensibilities have not been refined by education or science, may feel the pleasure in a more gross and brutal form. But do not the most polished natures feel a similar, a kindred pleasure, in the deep-wrought distresses of the well-imagined scene? Here the endeavour is, to introduce whatever is dreadful or pathetic, whatever can harrow up the feelings or extort the tear. And the deeper and more tragical the scene becomes, the more it agitates the several passions of terror, grief, or pity—the more intensely it delights, even the most polished minds. They seem to enjoy the various and vivid emotions of contending passions. They love to have the tear trembling in the eye, and to feel the whole soul wrapt in thrilling sensations. For that moment they seem to forget the fiction; and afterwards commend that exhibition most, in which they most entirely lost sight of the author, and of their own situation, and were alive to all the unutterable vibrations of strong or melting sensibility.

Taking it then for granted, that in the contemplation of many scenes of distress, both imaginary and real, a gratification is felt, let us endeavour to account for it, by mentioning some of those principles, woven into the web of human nature, by its benevolent Creator, on which that gratification depends.

Dr Akenfide, with his accustomed strength and brilliancy of colouring, describes and accounts for it in the following manner.

—“Behold the ways
Of heaven's eternal destiny to man!
For ever just, benevolent, and wise!
That Virtue's awful steps, how'er pursued
By vexing fortune, and intrusive pain,
Should never be divided from her chaste,
Her fair attendant, Pleasure. Need I urge
Thy tardy thought, through all the various round
Of this existence, that thy softening soul
At length may learn, what energy the hand
Of Virtue mingles in the bitter tide

Distress.
Of Passion, swelling with distress and pain,
To mitigate the sharp, with gracious drops
Of cordial Pleasure. Ask the faithful youth,
Why the cold urn of her, whom long he loved,
So often fills his arm? So often draws
His lonely footsteps, at the silent hour,
To pay the mournful tribute of his tears?
O! he will tell thee, that the wealth of worlds
Should ne'er seduce his bosom to forego
That sacred hour, when stealing from the noise
Of care and envy, sweet remembrance sooths,
With Virtue's kindest looks, his aching breast,
And turns his tears to rapture. Ask the croud,
Which flies impatient from the village-walk
To climb the neighbouring cliffs, when far below
The cruel winds have hurled upon the coast
Some helpless bark: whilst sacred Pity melts
The general eye, or Terror's icy hand
Smiles their distorted limbs, or horrent hair,
While every mother closer to her breast
Catches her child; and, pointing where the waves
Foam through the shattered vessel, shrieks aloud,
As one poor wretch, that spreads his piteous arms
For succour, swallowed by the roaring surge,
As now another, dashed against the rock,
Drops lifeless down. O dearest thou indeed
No kind endearment here, by nature given,
To mutual terror, and compassion's tears?
No sweetly melting softness, which attracts
O'er all that edge of pain, the social powers,
To this their proper action, and their end?”

The poet pursues the sentiment in the same animated imagery, describing the strong, but pleasurable, sensations which the soul feels, in reading the sufferings of heroes who nobly died in the cause of liberty and their country:

—“When the pious band
Of youths, who fought for freedom, and their fires,
Lie side by side in gore.”

Or, in the strong movements of indignation and revenge against the tyrant, who invades that liberty, and enslaves their country.

—“When the patriot's tear
Starts from thine eye, and thy extended arm
In fancy hurls the thunderbolt of Jove,
To fire the impious wreath on Philip's brow,
Or dash Octavius from his trophied car;
Say—Does thy secret soul repine to taste
The big distress? Or, would'st thou then exchange
Those heart-ennobling sorrows for the lot
Of him, who sits amid the gaudy herd
Of mute barbarians, bending to his nod,
And bears aloft his gold-invested front,
And says within himself, “I am a king,
And wherefore should the clamorous voice of wo
Intrude upon mine ear?”

The sentiment of this charming and moral poet is, that sympathetic feelings are virtuous, and therefore pleasant. And from the whole, he deduces this important conclusion; that every virtuous emotion must be agreeable, and that this is the sanction and the reward of virtue. The thought is amiable; the conclusion noble: but still the solution appears to us to be imperfect.

We have already said, that the pleasure arising from the contemplation of distressful scenes is a compounded feeling, arising from several distinct sources in the human breast. The kind and degree of the sensation must depend upon the various blendings of the several ingredients which enter into the composition. The cause assigned by Mr Addison, the sense of our own security, may be supposed to have some share in the mass of feelings. That of Dr Akenfide may be allowed to have

Distress. have a still larger proportion. Let us attempt to trace some of the rest.

There are few principles in human nature of more general and important influence than that of sympathy. A late ingenious writer, led by the fashionable idea of simplifying all the springs of human nature into one source, has, in his beautiful *Theory of Moral Sentiments*, endeavoured to analyse a very large number of the feelings of the heart into sympathetic vibration. Though it appears to us most probable, that the human mind, like the human body, possesses various and distinct springs of action and of happiness, yet he has shown, in an amazing diversity of instances, the operation and importance of this principle of human nature. Let us apply it to our present subject.

We naturally sympathize with the passions of others. But if the passions they appear to feel be not those of mere distress alone; if, midst the scenes of calamity, they display fortitude, generosity, and forgiveness; if, "rising superior to the cloud of ills which covers them," they nobly stand firm, collected, and patient; here a still higher source of pleasure opens upon us, from complacency, admiration, and that unutterable sympathy which the heart feels with virtuous and heroic minds. By the operation of this principle, we place ourselves in their situation; we feel, as it were, some share of that conscious integrity and peace which they must enjoy. Hence, as before observed, the pleasure will vary, both as to its nature and degree, according to the scene and characters before us. The shock of contending armies in the field,—the ocean wrought to tempest, and covered with the wreck of shattered vessels,—and a worthy family silently, yet nobly, bearing up against a multitude of surrounding sorrows, will excite very different emotions, because the component parts of the pleasurable sensation consist of very different materials. They all excite admiration; but admiration, how diversified, both as to its degree and its cause! These several ingredients may doubtless be so blended together, that the pleasure shall make but a very small part of the mixed sensation. The more agreeable tints may bear little proportion to the terrifying red or the gloomy black.

In many of the instances which have been mentioned, the pleasure must arise chiefly, if not solely, from the circumstances or accompaniments of the scene. The sublime feelings excited by the view of an agitated ocean, relieve and soften those occasioned by the shipwreck. And the awe excited by the presence of thousands of men, acting as with one soul, and displaying magnanimity and firmness in the most solemn trial, tempers those sensations of horror and of pain which would arise from the field of battle.

The gratification we are attempting to account for, depends also, in a very considerable degree, upon a principle of human nature, implanted in it for the wisest ends; the exercise which it gives to the mind, by rousing it to energy and feeling. Nothing is so insupportable, as that langour and ennui, for the full expression of which our language does not afford a term. How agreeable it is, to have the soul called forth to exertion and sensibility, let the gamester witness, who, unable to endure the lassitude and sameness of unanimated luxury, runs with eagerness to the

Distress. place where probably await him all the irritation and agony of tumultuous passions.

Again; it is a law of our nature, that opposite passions, when felt in succession, and, above all, when felt at the same moment, heighten and increase each other. Ease succeeding pain, certainty after suspense, friendship after aversion, are unspeakably stronger than if they had not been thus contrasted. In this conflict of feelings, the mind rises from passive to active energy. It is roused to intense sensation; and it enjoys that peculiar, exquisite, and complex feeling, in which, as in many articles of our table, the acid and the sweet, the pleasurable and painful, pungencies are so happily mixed together, as to render the united sensation amazingly more strong and delightful.

We have not yet mentioned the principle of curiosity, that busy and active power, which appears so early, continues almost unimpaired so long, and to which, for the wisest ends, is annexed so great a sense of enjoyment. To this principle, rather than to a love of cruelty, would we ascribe that pleasure which children sometimes seem to feel from torturing flies and lesser animals. They have not yet formed an idea of the pain they inflict. It is, indeed, of unspeakable consequence, that this practice be checked as soon and as effectually as possible, because it is so important, that they learn to connect the ideas of pleasure and pain with the motions and actions of the animal creation. And to this principle may we also refer no small share of that pleasure in the contemplation of distressful scenes, the springs of which, in the human heart, we are now endeavouring to open.

To curiosity, then—to sympathy—to mental exertion—to the idea of our own security—and to the strong feelings occasioned by viewing the actions and passions of mankind in interesting situations, do we ascribe that gratification which the mind feels from the survey of many scenes of sorrow. We have called it a *pleasure*; but it will approach towards, or recede from, pleasure, according to the nature and proportion of the ingredients of which the sensation is composed. In some cases, pain will predominate. In others, there will be exquisite enjoyment.

The final cause of this constitution of the human mind is probably, that by means of this strong sensation, the soul may be preserved in continual and vigorous motion—that its feelings may be kept lively and tender—that it may learn to practise the virtues it admires—and to assist those to whom its sympathy can reach—and that it may thus be led, by these social exercises of the heart, to soften with compassion—to expand with benevolence—and generously to assist in every case, in which assistance can be given. An end this sufficient,

— "To assert eternal Providence,
And justify the ways of God to man."

DISTRESS, in law, the seizing or distraining any thing for rent in arrear, or other duty unperformed.

The effect of this distress is to compel the party either to replevy the things distrained, and contest the taking, in an action of trespass against the distrainer; or rather to oblige him to compound and pay the debt or duty for which he was so distrained.

There are likewise compulsory distresses in actions,

Distress
||
Ditch.

to cause a person appear in court; of which kind there is a distress personal of one's moveable goods, and the profits of his lands, for contempt in not appearing after summons: there is likewise distress real, of a person's immoveable goods. In these cases none shall be distrained to answer for any thing touching their freeholds, but by the king's writ.

Distress may be either finite or infinite. Finite distress is that which is limited by law, in regard to the number of times it shall be made, in order to bring the party to a trial of the action. Infinite distress is that which is without any limitation, being made till the person appears: it is farther applied to jurors that do not appear; as, upon a certificate of assize, the process is *venire facias, habeas corpora*, and distress infinite.

It is also divided into grand distress and ordinary distress; of these the former extends to all the goods and chattels that the party has within the county. A person, of common right, may distrain for rents and all manner of services; and where a rent is reserved on a gift in tail, lease for life, or years, &c. though there be no clause of distress in the grant or lease, so as that he has the reversion: but on a feoffment made in fee, a distress may not be taken, unless it be expressly reserved in the deed.

DISTRIBUTION, in a general sense, the act of dividing a thing into several parts, in order to the disposing each in its proper place.

DISTRIBUTION, in architecture, the dividing and disposing the several parts and pieces which compose a building, as the plan directs. See ARCHITECTURE.

DISTRIBUTION, in rhetoric, a kind of description, whereby an orderly division and enumeration is made of the principal qualities of the subject. David supplies us with an example of this kind, when, in the heat of his indignation against sinners, he gives a description of their iniquity: "Their throat is an open sepulchre; they flatter with their tongues; the poison of asps is under their lips; their mouth is full of cursing and lies; and their feet are swift to shed blood."

DISTRIBUTION, in printing, the taking a form asunder, separating the letters, and disposing them in the cases again, each in its proper cell. See PRINTING.

DISTRICT, in geography, a part of a province, distinguished by peculiar magistrates, or certain privileges; in which sense it is synonymous with hundred. See HUNDRED.

DISTRINGAS, in law, a writ commanding the sheriff, or other officer, that he distrain a person for debt to the king, &c. or for his appearance at a certain day.

Distringas Juratores, a writ directed to the sheriff, whereby he is commanded to distrain upon a jury to appear, and to return issues on their lands, &c. for non-appearance. This writ of *distringas juratores* issues for the sheriff to have their bodies in court, &c. at the return of the writ.

DITCH, a common fence or inclosure in marshes, or other wet land where there are no hedges. They allow these ditches six feet wide against highways that are broad; and against commons, five feet. But the common ditches about inclosures, dug at the bottom of the bank on which the quick is raised, are three feet wide at the top, one at the bottom, and two feet deep. By this means each side has a slope, which is of great

N^o 102.

advantage; for where this is neglected, and the ditches dug perpendicular, the sides are always washing down, besides, in a narrow bottomed ditch, if cattle get down into it, they cannot stand to turn themselves to crop the quick: but where the ditch is four feet wide, it should be two and a half deep; and where it is five wide, it should be three deep; and so in proportion.

DITCH-Water is often used as an object for the microscope, and seldom fails to afford a great variety of animalcules. This water very often appears of a yellowish, greenish, or reddish colour; and this is wholly owing to the multitudes of animals of those colours which inhabit it. These animals are usually of the shrimp kind: and Swammerdam, who very accurately examined them, has called them, from the figure of their horns, *pulex aquaticus arborescens*. They copulate in May or June; and are often so numerous at that season, that the whole body of the water they are found in, is seen to be of a red, green, or yellowish colour, according to the colours of their bodies. The green thin scum also, so frequently seen on the surface of standing waters in summer, is no other than a multitude of small animalcules of this or some of the other kinds. Dunghill water is not less full of animals than that of ditches; and is often found so thronged with animalcules, that it seems altogether alive: it is then so very much crowded with these creatures, that it must be diluted with clear water before they can be distinctly viewed. There are usually in this fluid a sort of eels, which are extremely active; and besides these and many other of the common inhabitants of fluids, there is one species found in this which seems peculiar to it: the middle part of them is dark and beset with hairs, but the ends are transparent; their tails are tapering, with a long sprig at the extremity, and their motion is slow and waddling. See ANIMALCULE.

DITCH, in fortification, called also *foss* and *moat*, a trench dug round the rampart or wall of a fortified place, between the scarp and counterscarp. See FORTIFICATION.

DITHYRAMBUS, in ancient poetry, a hymn in honour of Bacchus, full of transport and poetical rage.

This poetry owes its birth to Greece, and to the transports of wine; and yet art is not quite exploded, but delicately applied to guide and restrain the dithyrambic impetuosity, which is indulged only in pleasing flights. Horace and Aristotle tell us, that the ancients gave the name of dithyrambus to those verses wherein none of the common rules or measures were observed. As we have now no remains of the dithyrambus of the ancients, we cannot say exactly what their measure was.

DITONE, in music, an interval comprehending two tones. The proportion of the sounds that form the ditone is 4:5, and that of the semiditone is 5:6.

DITRIHEDRIA, in mineralogy, a genus of spars with twice three sides, or six planes; being formed of two trigonal pyramids joined base to base, without any intermediate column. See SPAR.

The species of ditrihedria are distinguished by the different figures of these pyramids.

DITTANDER, in botany. See LEPIDIUM.

DITTANY, in botany. See DICTAMNUS.

DITTO, in books of accounts, usually written D^o, signifies the aforementioned. The word is corrupted from

Ditch
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Ditto.

Dival from the Italian *detto*, "the said:" as in our law-phrases, "the said premises," meaning the same as were aforementioned.

**Diversify-
ing.**

DIVAL, in heraldry, the herb nightshade, used by such as blazon by flowers and herbs, instead of colours and metals, for fable or black.

DIVALIA, in antiquity, a feast held among the ancient Romans, on the 21st day of December, in honour of the goddess Angerona; whence it is also called *Angeronalia*.—On the day of this feast, the pontifices performed sacrifice in the temple of Voluptia, or the goddess of joy and pleasure; who, some say, was the same with Angerona, and supposed to drive away all the sorrows and chagrins of life.

DIVAN, a council-chamber or court of justice among the eastern nations, particularly the Turks.—The word is Arabic, and signifies the same with *sofa* in the Turkish dialect.

There are two sorts of divans; that of the grand signior, called *the council of state*, which consists of seven of the principal officers of the empire; and that of the grand vizir, composed of six other vizirs or counsellors of state, the chancellor, and secretaries of state, for the distribution of justice.

The word is also used for a hall in the private houses of the orientals. The custom of China does not allow the receiving of visits in the inner parts of the house, but only at the entry, in a divan contrived on purpose for ceremonies.

Travellers relate wonders of the silence and expedition of the divans of the East.

DIVAN-Beghi, the superintendant of justice in Persia, whose place is the last of the six ministers of the second rank, who are all under the athemadauler or first minister. To this tribunal of the divan-beghi he appeals from sentences passed by the governors. He has a fixed stipend of 50,000 crowns for administering justice. All the serjeants, ushers, &c. of the court are in his service. He takes cognisance of the criminal causes of the chams, governors, and other great lords of Persia, when accused of any fault. There are divan-beghis not only at court and in the capital, but also in the provinces and other cities of the empire. The alcoran is the sole rule of his administration of justice, which also he interprets at pleasure. He takes no cognisance of civil causes; but all differences arising between the officers of the king's household and between foreign ministers are determined by him.

DIVANDUROW, the name of seven islands which lie a league north of the Maldives, and 24 from the coast of Malabar, almost opposite to Cananor.

DIVER, in ornithology. See **COLYMBUS**.

DIVERGENT, or **DIVERGING**, **LINES**, in geometry, are those which constantly recede from each other.

DIVERGENT Rays, in optics, are those which, going from a point of the visible object, are dispersed, and continually depart one from another, in proportion as they are removed from the object: in which sense it is opposed to convergent. See **OPTICS**.

DIVERSIFYING, in rhetoric, is of infinite service to the orator; it is an accomplishment essential to his character, and may fitly be called the subject of all his tropes and figures. Vossius lays down six ways of diversifying a subject. 1. By enlarging on what was briefly mentioned before. 2. By a concise enumeration

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tion of what had been insisted on at length. 3. By adding something new to what is repeated. 4. By repeating only the principal heads of what had been said. 5. By transposing the words and periods. 6. By imitating them.

Diversion.

DIVERSION, in military affairs, is when an enemy is attacked in one place where they are weak and unprovided, in order to draw off their forces from another place where they have made or intend to make an irruption. Thus the Romans had no other way in their power of driving Hannibal out of Italy, but by making a diversion in attacking Carthage.

DIVESTING, properly signifies undressing, or stripping off one's garment; in contradistinction from investing.

In law, it is used for the act of surrendering or relinquishing one's effects. By a contract of donation or sale, the donor or seller is said to be disseised and divested of their property in such a commodity, and the donee or purchaser becomes invested therewith. See **INVESTITURE**.

A *demise* is a general divestiture which the fathers and mothers make of all their effects in favour of their children.

DIVIDEND, in arithmetic, the number proposed to be divided into equal parts. See **ARITHMETIC**, n° 14.

DIVIDEND of Stocks, is a share or proportion of the interest of stocks erected on public funds, as the South-sea, &c. divided among and paid to the adventurers half-yearly.

DIVINATION, the knowledge of things obscure or future, which cannot be attained by any natural means.

It was a received opinion among the heathens, that the gods were wont to converse familiarly with some men, whom they endowed with extraordinary powers, and admitted to the knowledge of their councils and designs. Plato, Aristotle, Plutarch, Cicero, and others, divide divination into two sorts or species, *viz.* natural and artificial.

The former was so called, because not attained by any rules or precepts of art, but infused or inspired into the diviner, without his taking any further care about it than to purify and prepare himself for the reception of the divine afflatus. Of this kind were all those who delivered oracles, and foretold future events by inspiration, without observing external signs or accidents.

The second species of divination was called *artificial*, because it was not obtained by immediate inspiration, but proceeded upon certain experiments and observations arbitrarily instituted, and mostly superstitious. Of this sort there were various kinds, as by sacrifices, entrails, flame, cakes, flour, wine, water, birds, lots, verses, omens, &c.

In holy scripture we find mention made of nine different kinds of divination. The first performed by the inspection of planets, stars, and clouds: it is supposed to be the practisers of this whom Moses calls *מְנַחֲשֵׁי מְנָח* *menacheshi menach*, of *מָנָח* *anan*, "cloud," Deuter. ch. xviii. v. 10. 2. Those whom the prophet calls in the same place *מְנַחֲשֵׁי מְנַחֲשֵׁה* *menacheshi menachesh*, which the vulgate and generality of interpreters render *augur*. 3. Those who in the same place are called *מְנַחֲשֵׁי מְנַחֲשֵׁה* *menacheshi menachesh*, which the septuagint and

Divination. and vulgate translate "a man given to ill practices."

4. Such authors whom Moses in the same chapter, ver. 11. calls חֹבֵב *hobber*. 5. Those who consult the spirits called *Python*; or, as Moses expresses it in the same book, אֲנֹכִי שֶׁל "those who ask questions of Python." 6. Witches or magicians, whom Moses calls יְדֻעִי *judeoni*. 7. Those who consult the dead, *necromancers*. 8. The prophet Hosea, chap. iv. ver. 12. mentions such as consult staves, שֶׁל קֶשֶׁף; which kind of divination may be called *rhabdomancy*. 9. The last kind of divination mentioned in scripture is *hepatoscopy*, or the consideration of the liver.

Divination of all kinds was necessarily made an occult science, which naturally remained in the hands of the priests and priestesses, the magi, the soothsayers, the augurs, the visionaries, the priests of the oracles, the false prophets, and other like professors, till the time of the coming of Jesus Christ. The light of the gospel, it is true, has dissipated much of this darkness; but it is more difficult, than is commonly conceived, to eradicate from the human mind a deep-rooted superstition, even though the truth be set in the strongest light, especially when the error has been believed almost from the origin of the world: so we still find existing among us the remains of this pagan superstition, in the following chimeras, which enthusiastic and designing men have formed into arts and sciences; though it must be owned, to the honour of the 18th century, that the pure doctrines of Christianity, and the spirit of philosophy, which become every day more diffused, equally concur in banishing these visionary opinions. The vogue for these pretended sciences and arts, moreover, is past, and they can no longer be named without exciting ridicule in all sensible people. By relating them here, therefore, and drawing them from their obscurity, we only mean to show their futility, and to mark those rocks against which the human mind, without the assistance of a pilot, might easily run.

For the attaining of these supernatural qualifications, there are still existing in the world the remains of,

1. *Astrology*: a conjectural science which teaches to judge of the effects and influences of the stars; and to predict future events by the situation of the planets and their different aspects. It is divided into *natural astrology*, or *meteorology*; which is confined to the foretelling of natural effects, as the winds, rain, hail, and snow, frosts and tempests. In this consists one branch of the art of almanack-makers; and by merely confronting these predictions in the kalendar, with the weather each day produces, every man of sense will see what regard is to be paid to this part of astrology. The other part, which is called *judicial astrology*, is still far more illusive and rash than the former: and having been at first the wonderful art of visionaries, it afterwards became that of impostors; a very common fate with all those chimerical sciences, of which we shall here speak. This art pretends to teach the method of predicting all sorts of events that shall happen upon the earth, as well such as relate to the public as to private persons; and that by the same inspection of the stars and planets and their different constellations. The *cabala* signifies, in like manner, the knowledge of things that are above the moon, as the celestial bodies

and their influences; and in this sense it is the same Divination. with judicial astrology, or makes a part of it.

2. *Horoscopy*, which may also be considered as a part of astrology, is the art by which they draw a figure, or celestial scheme, containing the 12 houses, wherein they mark the disposition of the heavens at a certain moment; for example, that at which a man is born, in order to foretel his fortune, or the incidents of his life. In a word, it is the disposition of the stars and planets at the moment of any person's birth. But as there cannot be any probable or possible relation between the constellations and the human race, all the principles they lay down, and the prophecies they draw from them, are chimerical, false, absurd, and a criminal imposition on mankind.

3. The art of *augury* consisted, among the ancient Romans, in observing the flight, the singing and eating of birds, especially such as were held sacred. See *AUGURY*.

4. The equally deceitful art of *haruspicy* consisted, on the contrary, in the inspection of the bowels of animals, but principally of victims; and from thence predicting grand incidents relative to the republic, and the good or bad events of its enterprises.

5. *Aeromancy* was the art of divining by the air. This vain science has also come to us from the Pagans: but is rejected by reason as well as Christianity, as false and absurd.

6. *Pyromancy* is a divination made by the inspection of a flame, either by observing to which side it turns, or by throwing into it some combustible matter, or a bladder filled with wine, or any thing else from which they imagined they were able to predict.

7. *Hydromancy* is the supposed art of divining by water. The Persians, according to Varro, invented it; Pythagoras and Numa Pompilius made use of it; and we still admire the like wonderful prognosticators.

8. *Geomancy* was a divination made by observing of cracks or clefts in the earth. It was also performed by points made on paper, or any other substance, at a venture; and they judged of future events from the figures that resulted from thence. This was certainly very ridiculous; but it is nothing less so to pretend to predict future events by the inspection of the grounds of a dish of tea or coffee, or by cards, and many other like matters.—Thus have designing men made use of the four elements to deceive their credulous brethren.

9. *Chiromancy* is the art which teaches to know, by inspecting the hand, not only the inclinations of a man, but his future destiny also. The fools or impostors who practise this art pretend, that the different parts or the lines of the hand have a relation to the internal parts of the body, as some to the heart, others to the liver, spleen, &c. On this false supposition, and on many others equally extravagant, the principles of chiromancy are founded: and on which, however, several authors, as Robert Flud an Englishman, Artemidorus, M. de la Chambre, John of Indagina, and many others, have written large treatises.

10. *Physiognomy*, or *physiognomancy*, is a science that pretends to teach the nature, the temperament, the understanding, and the inclinations of men, by the inspection

Divine, spection of their countenances, and is therefore very little less frivolous than chiromancy; though Aristotle, and a number of learned men after him, have written express treatises concerning it.

DIVINE, something relating to God. The word is also used, figuratively, for any thing that is excellent, extraordinary, and that seems to go beyond the power of nature and the capacity of mankind. In which sense, the compass, telescope, clocks, &c. are said to be *divine inventions*: Plato is called the *divine author*, the *divine Plato*; and the same appellation is given to Seneca: Hippocrates is called, "the divine old man," *divinus senex*, &c.

DIVING, the art or act of descending under water to considerable depths, and abiding there a competent time.

The uses of diving are very considerable, particularly in the fishing for pearls, corals, sponges, &c. See *PEARL-Fishing*, &c.

There have been various methods proposed, and machines contrived, to render the business of diving more safe and easy. The great point is to furnish the diver with fresh air; without which, he must either make a short stay or perish.

Those who dive for sponges in the Mediterranean, help themselves by carrying down sponges dipt in oil in their mouths. But considering the small quantity of air that can be contained in the pores of a sponge, and how much that little will be contracted by the pressure of the incumbent water, such a supply cannot long subsist the diver. For it is found by experiment, that a gallon of air included in a bladder, and by a pipe reciprocally inspired and expired by the lungs, becomes unfit for respiration in little more than one minute of time. For though its elasticity be but little altered in passing the lungs, yet it loses its vivifying spirit, and is rendered effete.

In effect, a naked diver, Dr Halley assures us, without a sponge, cannot remain above a couple of minutes inclosed in water, nor much longer with one, without suffocating; nor, without long practice, near so long; ordinary persons beginning to stifle in about half a minute. Besides, if the depth be considerable, the pressure of the water in the vessels makes the eyes blood-shot, and frequently occasions a spitting of blood.

Hence, where there has been occasion to continue long at the bottom, some have contrived double flexible pipes, to circulate air down into a cavity, inclosing the diver as with armour, both to furnish air and to bear off the pressure of the water, and give leave to his breast to dilate upon inspiration; the fresh air being forced down one of the pipes with bellows, and returning by the other of them, not unlike to an artery and vein.

But this method is impracticable when the depth surpasses three fathoms; the water embracing the bare limbs so closely as to obstruct the circulation of the blood in them; and withal pressing so strongly on all the junctures where the armour is made tight with leather, that, if there be the least defect in any of them, the water rushes in, and instantly fills the whole engine, to the great danger of the diver's life.

It is certain, however, that people, by being accustomed to the water from their infancy, will at length

be enabled, not only to stay much longer under water than the time above mentioned, but put on a kind of amphibious nature, so that they seem to have the use of all their faculties as well when their bodies are immersed in water as when they are on dry land. Most savage nations are remarkable for this. According to the accounts of our late voyagers, the inhabitants of the South-sea islands are such expert divers, that when a nail or any piece of iron was thrown overboard, they would instantly jump into the sea after it, and never failed to recover it, notwithstanding the quick descent of the metal. Even among civilized nations, many persons have been found capable of continuing an incredible length of time below water. The most remarkable instance of this kind is the famous Sicilian diver Nicolo Pesce. The authenticity of the account, indeed, depends entirely on the authority of F. Kircher. He assures us, that he had it from the archives of the kings of Sicily: but, notwithstanding this assertion, the whole hath so much of the marvellous in it, that we believe there are few who will not look upon it to have been exaggerated. "In the times of Frederic king of Sicily (says Kircher), there lived a celebrated diver, whose name was *Nicholas*, and who, from his amazing skill in swimming, and his perseverance under water, was surnamed the *fish*. This man had from his infancy been used to the sea; and earned his scanty subsistence by diving for corals and oysters, which he sold to the villagers on shore. His long acquaintance with the sea, at last, brought it to be almost his natural element. He was frequently known to spend five days in the midst of the waves, without any other provisions than the fish which he caught there and ate raw. He often swam over from Sicily into Calabria, a tempestuous and dangerous passage, carrying letters from the king. He was frequently known to swim among the gulphs of the Lipari islands, noway apprehensive of danger.

"Some mariners out at sea, one day observed something at some distance from them, which they regarded as a sea-monster; but upon its approach it was known to be Nicholas, whom they took into their ship. When they asked him whither he was going in so stormy and rough a sea, and at such a distance from land, he showed them a packet of letters, which he was carrying to one of the towns of Italy, exactly done up in a leather bag, in such a manner as that they could not be wetted by the sea. He kept them thus company for some time in their voyage, conversing, and asking questions; and after eating an hearty meal with them, he took his leave, and, jumping into the sea, pursued his voyage alone.

"In order to aid these powers of enduring in the deep, nature seemed to have assisted him in a very extraordinary manner: for the spaces between his fingers and toes were webbed, as in a goose; and his chest became so very capacious, that he could take in, at one inspiration, as much breath as would serve him for a whole day.

"The account of so extraordinary a person did not fail to reach the king himself; who commanded Nicholas to be brought before him. It was no easy matter to find Nicholas, who generally spent his time in the solitudes of the deep; but, at last, after much searching, he was found, and brought before his majesty.

Diving.

fly. The curiosity of this monarch had been long excited by the accounts he had heard of the bottom of the gulph of Charybdis; he now therefore conceived, that it would be a proper opportunity to have more certain information. He therefore commanded our poor diver to examine the bottom of this dreadful whirlpool; and as an incitement to his obedience, he ordered a golden cup to be flung into it. Nicholas was not insensible of the danger to which he was exposed; dangers best known only to himself; and therefore he presumed to remonstrate: but the hopes of the reward, the desire of pleasing the king, and the pleasure of showing his skill, at last prevailed. He instantly jumped into the gulph, and was as instantly swallowed up in its bosom. He continued for three quarters of an hour below; during which time the king and his attendants remained on shore, anxious for his fate; but he at last appeared, holding the cup in triumph in one hand, and making his way good among the waves with the other. It may be supposed he was received with applause when he came on shore: the cup was made the reward of his adventure; the king ordered him to be taken proper care of; and, as he was somewhat fatigued and debilitated by his labour, after an hearty meal he was put to bed, and permitted to refresh himself by sleeping.

"When his spirits were thus restored, he was again brought to satisfy the king's curiosity with a narrative of the wonders he had seen; and his account was to the following effect. He would never, he said, have obeyed the king's commands, had he been apprised of half the dangers that were before him. There were four things, he said, which rendered the gulph dreadful, not only to men, but to fishes themselves. 1. The force of the water bursting up from the bottom, which required great strength to resist. 2. The abruptness of the rocks that on every side threatened destruction. 3. The force of the whirlpool dashing against those rocks. And, 4. The number and magnitude of the polypous fish, some of which appeared as large as a man; and which, every where sticking against the rocks, projected their fibrous arms to entangle him. Being asked how he was able so readily to find the cup that had been thrown in, he replied, that it happened to be flung by the waves into the cavity of a rock against which he himself was urged in his descent. This account, however, did not satisfy the king's curiosity. Being requested to venture once more into the gulph for further discoveries, he at first refused: but the king, desirous of having the most exact information possible of all things to be found in the gulph, repeated his solicitations; and, to give them still greater weight, produced a larger cup than the former, and added also a purse of gold. Upon these considerations the unfortunate diver once again plunged into the whirlpool, and was never heard of more."

To obviate the inconveniences of diving to those who have not the extraordinary powers of the diver above mentioned, different instruments have been contrived. The chief of these is the diving bell; which is most conveniently made in form of a truncated cone, the smaller base being closed, and the larger open. It is to be poised with lead; and so suspended, that the vessel may sink full of air, with its open basis down-

ward, and as near as may be in a situation parallel to the horizon, so as to close with the surface of the water all at once.

Diving.

Under this coverle the diver sitting, sinks down with the included air to the depth desired: and if the cavity of the vessel can contain a tun of water, a single man may remain a full hour, without much inconvenience, at five or six fathoms deep. But the lower you go, still the included air contracts itself according to the weight of the water which compresses it: so that at 33 feet deep the bell becomes half full of water, the pressure of the incumbent water being then equal to that of the atmosphere; and at all other depths the space occupied by the compressed air in the upper part of the bell will be to the under part of its capacity filled with water, as 33 feet to the surface of the water in the bell below the common surface thereof. And this condensed air being taken in with the breath soon insinuates itself into all the cavities of the body, and has no ill effect, provided the bell be permitted to descend so slowly as to allow time for that purpose. One inconvenience that attends it, is found in the ears, within which there are cavities which open only outwards, and that by pores so small as not to give admission even to the air itself, unless they be dilated and distended by a considerable force. Hence, on the first descent of the bell, a pressure begins to be felt on each ear; which, by degrees, grows painful, till the force overcoming the obstacle, what constricts these pores yields to the pressure, and letting some condensed air slip in, presently ease ensues. The bell descending lower, the pain is renewed, and again eased in the same manner.

But the greatest inconvenience of this engine is, that the water entering it, contracts the bulk of air into so small a compass, that it soon heats and becomes unfit for respiration: so that there is a necessity for its being drawn up to recruit it; besides the uncomfortable abiding of the diver almost covered with water.

To obviate the difficulties of the diving-bell, Dr Halley, to whom we owe the preceding account, contrived some further apparatus, whereby not only to recruit and refresh the air from time to time, but also to keep the water wholly out of it at any depth. The manner in which this was effected, he relates in the following words.

"The bell I made use of was of wood, containing about 60 cubic feet in its concavity; and was of the form of a truncate cone, whose diameter at the top was three feet, and at the bottom five. This I coated with lead so heavy that it would sink empty; and I distributed the weight so about its bottom, that it would go down in a perpendicular direction, and no other. In the top I fixed a strong but clear glass, as a window, to let in the light from above; and likewise a cock to let out the hot air that had been breathed: and below, about a yard under the bell, I placed a stage which hung by three ropes, each of which was charged with about one hundred weight to keep it steady. This machine I suspended from the mast of a ship by a sprit, which was sufficiently secured by stays to the mast-head, and was directed by braces to carry it overboard clear of the ship's side, and to bring it again within board as occasion required.

To

Fig. 1. Halp's Diving Bell. Fig. 2. Tricewald's.

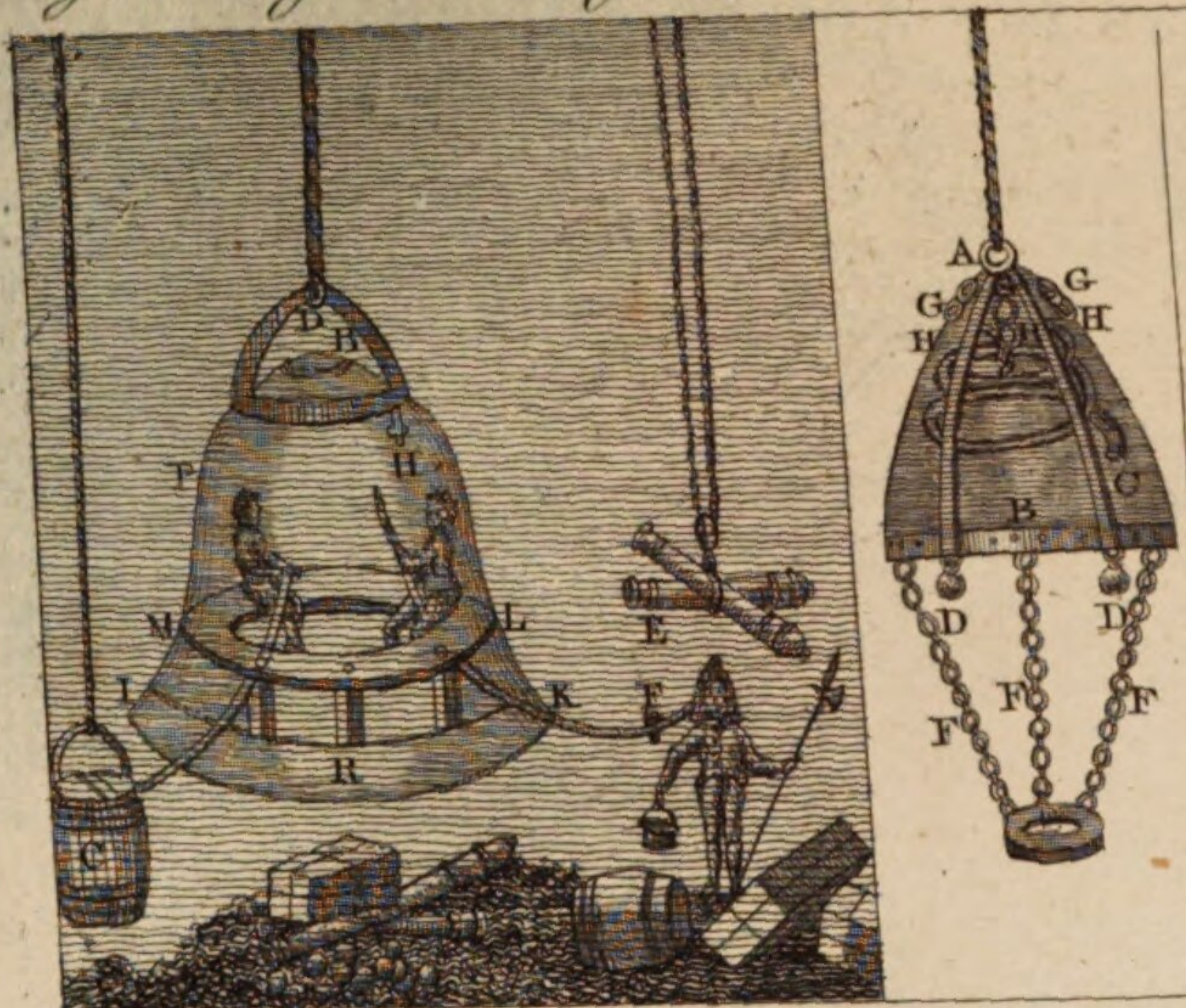


Fig. 3. Spalding's.

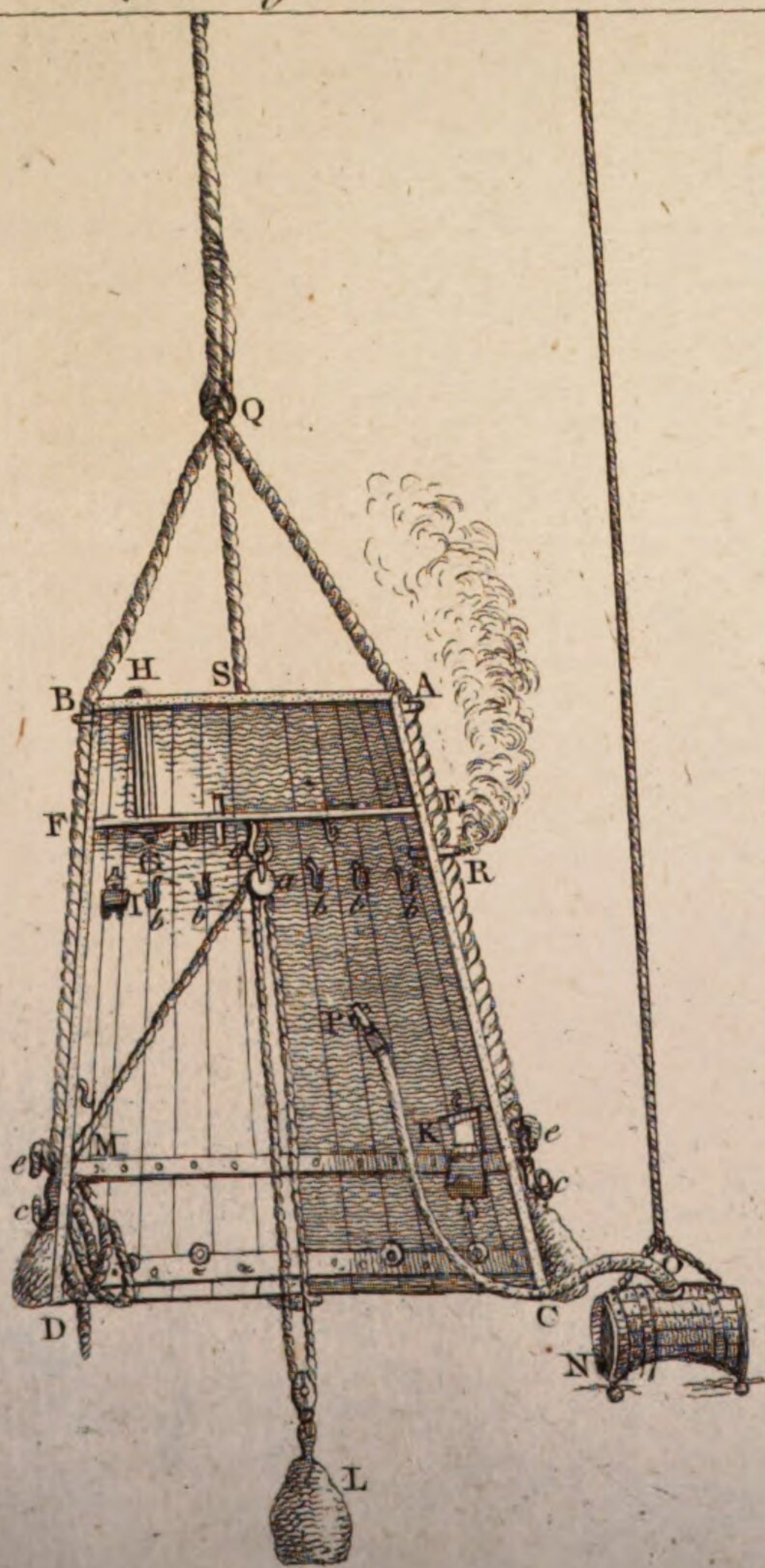


Fig. 4.



Diving.

"To supply air to this bell when under water, I caused a couple of barrels of about 36 gallons each to be cased with lead, so as to sink empty; each of them having a bung-hole in its lowest parts to let in the water, as the air in them condensed on their descent; and to let it out again when they were drawn up full from below. And to a hole in the uppermost part of these barrels, I fixed a leathern trunk or hose well liquored with bees wax and oil, and long enough to fall below the bung-hole, being kept down by a weight appended: so that the air in the upper part of the barrels could not escape, unless the lower ends of these hose were first lifted up.

"The air-barrels being thus prepared, I fitted them with tackle proper to make them rise and fall alternately, after the manner of two buckets in a well; which was done with so much ease, that two men, with less than half their strength, could perform all the labour required: and in their descent they were directed by lines fastened to the under edge of the bell, the which passed through rings on both sides the leathern hose in each barrel; so that, sliding down by these lines, they came readily to the hand of a man who stood on the stage on purpose to receive them, and to take up the ends of the hose into the bell. Through these hose, as soon as their ends came above the surface of the water in the barrels, all the air that was included in the upper parts of them was blown with great force into the bell; whilst the water entered at the bung-holes below, and filled them: and as soon as the air of one barrel had been thus received, upon a signal given, that was drawn up, and at the same time the other descended; and, by an alternate succession, furnished air so quick, and in so great plenty, that I myself have been one of five who have been together at the bottom in nine or ten fathom water, for above an hour and an half at a time, without any sort of ill consequence: and I might have continued there as long as I pleased, for any thing that appeared to the contrary. Besides, the whole cavity of the bell was kept entirely free from water, so that I sat on a bench which was diametrically placed near the bottom, wholly dressed, with all my cloaths on. I only observed, that it was necessary to be let down gradually at first, as about 12 feet at a time; and then to stop and drive out the air that entered, by receiving three or four barrels of fresh air before I descended further. But being arrived at the depth designed, I then let out as much of the hot air that had been breathed, as each barrel would replenish with cool, by means of the cock at the top of the bell; through whose aperture, though very small, the air would rush with so much violence, as to make the surface of the sea boil, and to cover it with a white foam, notwithstanding the weight of the water over us.

"Thus I found that I could do any thing that required to be done just under us; and that, by taking off the stage, I could, for a space as wide as the circuit of the bell, lay the bottom of the sea so far dry, as not to be overshoes thereon. And, by the glass window, so much light was transmitted, that when the sea was clear, and especially when the sun shone, I could see perfectly well to write or read; much more to fasten or lay hold on any thing under us that was

6.

to be taken up. And, by the return of the air-barrels, I often sent up orders written with an iron pen, on small plates of lead, directing how to move us from place to place as occasion required. At other times, when the water was troubled and thick, it would be as dark as night below; but in such cases I have been able to keep a candle burning in the bell as long as I pleased, notwithstanding the great expence of air necessary to maintain flame.—By an additional contrivance, I have found it not impracticable for a diver to go out of an engine to a good distance from it, the air being conveyed to him with a continued stream, by small flexible pipes; which pipes may serve as a clue, to direct him back again when he would return to the bell."

Plate CLXIII. fig. 1. shows Dr Halley's diving bell, with the divers at work. DBLK RIMP represents the body of the bell. D, the glass which serves as a window. B, the cock for letting out the air which has been breathed. LM, the seats. C, one of the air-barrels. P, H, two of the divers. F, another diver at a distance from the bell, and breathing through the flexible tube K.—This diver is supposed to have a head-piece of lead, made to fit quite close about his shoulders: this head-piece was capable of containing as much air as would supply him for a minute or two. When he had occasion for more air, he turned a cock at F, by which means a communication was opened with the air in the bell, and thus he could receive a new supply at pleasure.

Since the invention of this diving machine, there has been one contrived by Mr Triewald, F. R. S. and military architect to the king of Sweden, which, for a single person, is in some respects thought to be more eligible than Dr Halley's, and is constructed as follows. AB is the bell, which is sunk by lead weights DD hung to its bottom. This bell is of copper, and tinned all over in the inside, which is illuminated by three strong convex lenses, G, G, G, with copper lids H, H, H, to defend them. The iron ring or plate E serves the diver to stand on when he is at work; and is suspended at such a distance from the bottom of the bell by the chains F, F, F, that when the diver stands upright, his head is just above the water in the bell, where the air is much better than higher up, because it is colder, and consequently more fit for respiration. But as the diver must always be within the bell, and his head of course in the upper part, the inventor has contrived, that even there, when he has breathed the hot air as well as he can, he may, by means of a spiral copper tube *bc*, placed close to the inside of the bell, draw the cooler and fresher air from the lowermost parts: for which purpose, a flexible leather tube, about two feet long, is fixed to the upper end of the copper tube at *b*; and to the other end of this tube is fixed an ivory mouth-piece, by which the diver draws in the air.

The greatest improvement, however, which the diving bell ever received, or probably can receive, was from the late Mr Spalding of Edinburgh. A section of his improved diving-bell is represented in fig. 3. This construction is designed to remedy some inconveniences of Dr Halley's, which are very evident, and of very dangerous tendency. These are, 1. By Dr Halley's construction, the sinking or raising of the bell depends en-

tirely

Diving.

Fig. 2.

Fig. 3.

Diving.

tirely on the people who are at the surface of the water; and as the bell even when in the water has a very considerable weight, the raising it not only requires a great deal of labour, but there is a possibility of the rope breaking by which it is raised, and thus every person in the bell would inevitably perish. 2. As there are, in many places of the sea, rocks which lie at a considerable depth, the figure of which cannot possibly be perceived from above, there is danger that some of their ragged prominences may catch hold of one of the edges of the bell in its descent, and thus overset it before any signal can be given to those above, which would infallibly be attended with the destruction of the people in the bell: and as it must always be unknown, before trial, what kind of a bottom the sea has in any place, it is plain, that without some contrivance to obviate this last danger, the descent in Dr Halley's diving-bell is not at all eligible.

How these inconveniences are remedied by Mr Spalding's new construction will be easily understood from the following description.—A B C D represents a section of the bell, which is made of wood; *e, e*, are iron hooks, by means of which it is suspended by ropes Q B F *e*, and Q A E R *e*, and Q S, as expressed in the figure: *c, c*, are iron hooks, to which are appended lead weights, that keep the mouth of the bell always parallel to the surface of the water, whether the machine taken altogether is lighter or heavier than an equal bulk of water. By these weights alone, however, the bell would not sink: another is therefore added, represented at L; and which can be raised or lowered at pleasure, by means of a rope passing over the pulley *a*, and fastened to one of the sides of the bell at M. As the bell descends, this weight, called by Mr Spalding the *balance weight*, hangs down a considerable way below the mouth of the bell. In case the edge of the bell is caught by any obstacle, the balance-weight is immediately lowered down so that it may rest upon the bottom. By this means the bell is lightened so that all danger of upsetting is removed; for being lighter, without the balance-weight, than an equal bulk of water, it is evident that the bell will rise, as far as the length of the rope affixed to the balance-weight will allow it. This weight, therefore, will serve as a kind of anchor to keep the bell at any particular depth which the divers may think necessary; or by pulling it quite up, the descent may be continued to the very bottom.

By another very ingenious contrivance, Mr Spalding rendered it possible for the divers to raise the bell, with all the weights appended to it, even to the surface, or to stop at any particular depth, as they think proper; and thus they could still be safe, even though the rope designed for pulling up the bell was broke. For this purpose the bell is divided into two cavities, both of which are made as tight as possible. Just above the second bottom E F, are small slits in the sides of the bell; through which the water, entering as the bell descends, displaces the air originally contained in this cavity, which flies out at the upper orifice of the cock G H. When this is done, the divers turn the handle G, which stops the cock; so that if any more air was to get into the cavity A E F B, it could not longer be discharged through the orifice H as before. When this cavity is full of water, the bell

sinks; but when a considerable quantity of air is admitted, it rises. If therefore the divers have a mind to raise themselves, they turn the small cock g, by which a communication is made between the upper and under cavities of the bell. The consequence of this is, that a quantity of air immediately enters the upper cavity, forces out a quantity of the water contained in it, and thus renders the bell lighter by the whole weight of the water which is displaced. Thus, if a certain quantity of air is admitted into the upper cavity, the bell will descend very slowly; if a greater quantity, it will neither ascend nor descend, but remain stationary; and if a larger quantity of air is still admitted, it will arise to the top. It is to be observed, however, that the air which is thus let out into the upper cavity must be immediately replaced from the air-barrel; and the air is to be let out very slowly, or the bell will rise to the top with so great velocity that the divers will be in danger of being shaken out of their seats. But, by following these directions, every possible accident may be prevented, and people may descend to great depths without the least apprehension of danger. The bell also becomes so easily manageable in the water, that it may be conducted from one place to another by a small boat with the greatest ease, and with perfect safety to those who are in it.

Instead of wooden seats used by Dr Halley, Mr Spalding made use of ropes suspended by hooks *bbb*; and on these ropes the divers may sit without any inconvenience. I and K are two windows made of thick strong glass, for admitting light to the divers. N represents an air-cask with its tackle, and O C P the flexible pipe through which the air is admitted to the bell. In the ascent and descent of this cask the pipe is kept down by a small weight appended, as in Dr Halley's machine. R is a small cock by which the hot air is discharged as often as it becomes troublesome. Fig. 4. is a representation of the whole diving apparatus, which it is hoped will be readily understood without any further explanation. Two air-barrels are represented in this figure; but Mr Spalding was of opinion, that one capable of containing 30 gallons is sufficient for an ordinary machine.

Fig. 4.

We are told of another method put in practice by a gentleman of Devonshire. He has contrived a large case of strong leather, perfectly water-proof, which may hold about half a hoghead of air. This is so contrived, that, when he shuts himself up in this case, he may walk at the bottom of the sea, and go into any part of a wrecked vessel, and deliver out the goods. This method, we are told, he has practised for many years, and has thus acquired a large fortune. It would be a considerable improvement on this machine to condense the air in it as much as possible before the diver descended; as he would thus be furnished with an atmosphere endued with elasticity sufficient to resist the weight of the water, which otherwise would squeeze his case into much less room than it originally took up. The condensed air also would serve for respiration a much longer time than that which is in its ordinary state.

DIVING-Bladder, a machine invented by Borelli, and by him preferred, though without any good reason, to the diving-bell. It is a globular vessel of brass or copper, about two feet in diameter, which contains the

Diving the diver's head. It is fixed to a goat's-skin habit exactly fitted to his person. Within the vessel are pipes; **Divisibility** by means of which a circulation of air is contrived; and the person carries an air-pump by his side, by which he can make himself heavier or lighter as fishes do, by contracting or dilating their air bladder. By this means he thought all the objections to which other diving machines are liable were entirely obviated, and particularly that of want of air; the air which had been breathed, being, as he imagined, deprived of its noxious qualities by circulating through the pipes. These advantages, however, it is evident, are only imaginary. The diver's limbs, being defended from the pressure of the water only by a goat's-skin, would infallibly be crushed if he descended to any considerable depth; and from the discoveries now made by Dr Priestley and others, it is abundantly evident, that air, which is once rendered foul by breathing, cannot in any degree be restored by circulation through pipes. Concerning the use of copper machines in general, Mr Spalding favoured us with the following curious observation, namely, That when a person has breathed in them a few minutes, he feels in his mouth a very disagreeable brassy taste, which continues all the time he remains in the vessel; so that, on this account, copper seems by no means an eligible material. This taste most probably arises from the action of the alkalescent effluvia of the body upon the copper; for volatile alkali is a strong dissolvent of this metal: but how these effluvia volatilise the copper in such a manner as to make the taste of it sensible in the mouth, it is not easy to say.

DIVINITY, properly signifies the nature, quality, and essence of God.

DIVINITY, is also used in the same sense with theology.

DIVISIBILITY, that property by which the particles of matter in all bodies are capable of a separation or disunion from each other.

The Peripatetics and Cartesians hold divisibility to be an affection of all matter. The Epicureans, again, allow it to agree to every physical continuum; but they deny that this affection agrees to all bodies, for the primary corpuscles or atoms they maintain to be perfectly inseparable and indivisible.

As it is evident that body is extended, so it is no less evident that it is divisible: for since no two particles of matter can exist in the same place, it follows, that they are really distinct from each other; which is all that is meant by being divisible. In this sense the least conceivable particle must still be divisible, since it will consist of parts which will be really distinct. To illustrate this by a familiar instance. Let the least imaginable piece of matter be conceived lying on a smooth plain surface, it is evident the surface will not touch it every where: those parts therefore which it does not touch may be supposed separable from the others, and so on as far as we please; and this is all that is meant when we say matter is infinitely divisible.

Plate
CLXII.

The infinite divisibility of mathematical quantity is demonstrated thus geometrically. Suppose the line AC perpendicular to BF; and another, as GH, at a small distance from it, also perpendicular to the same line: with the centres CCC, &c. describe circles cutting the line GH in the points *eee*, &c. Now the

greater the radius AC is, the less is the part *eH*. But the radius may be augmented in infinitum; so long, therefore, the part *eH* may be divided into still less portions; consequently it may be divided in infinitum. **Divisibility, Division.**

All that is supposed in strict geometry (says Mr Maclaurin) concerning the divisibility of magnitude, amounts to no more than that a given magnitude may be conceived to be divided into a number of parts equal to any given or proposed number. It is true, that the number of parts into which a given magnitude may be conceived to be divided, is not to be fixed or limited, because no given number is so great but a greater may be conceived and assigned: but there is not, therefore, any necessity of supposing the number of parts actually infinite; and if some have drawn very abstruse consequences from such a supposition, yet geometry ought not to be loaded with them.

How far matter may actually be divided, may in some measure be conceived from hence, that a piece of wire gilt with so small a quantity as eight grains of gold, may be drawn out to a length of 13,000 feet, the whole surface of it still remaining covered with gold. We have also a surprising instance of the minuteness of some parts of matter from the nature of light and vision. Let a candle be lighted, and placed in an open plain, it will then be visible two miles round; and consequently was it placed two miles above the surface of the earth, it would fill with luminous particles a sphere whose diameter was four miles, and that before it had lost any sensible part of its weight. A quantity of vitriol being dissolved, and mixed with 9000 times as much water, will tinge the whole; consequently will be divided into as many parts as there are visible portions of matter in that quantity of water. There are perfumes, which, without a sensible diminution of their quantity, shall fill a very large space with their odoriferous particles; which must therefore be of an inconceivable smallness, since there will be a sufficient number in every part of that space sensibly to affect the organ of smelling. Dr Keill demonstrates, that any particle of matter, how small soever, and any finite space, how large soever, being given, it is possible for that small particle of matter to be diffused through all that space, and to fill it in such a manner, as that there shall be no pore in it whose diameter shall exceed any given line.

The chief objections against the divisibility of matter in infinitum are, That an infinite cannot be contained by a finite; and that it follows from a divisibility in infinitum, either that all bodies are equal, or that one infinite is greater than another. But the answer to these is easy; for the properties of a determined quantity are not to be attributed to an infinite considered in a general sense; and who has ever proved that there could not be an infinite number of infinitely small parts in a finite quantity, or that all infinities are equal? The contrary is demonstrated by mathematicians in innumerable instances. See the article **INFINITE**, and *'S Gravesande Elem. Mathem. l. i. c. 4.*

DIVISION, in general, is the separating a thing into two or more parts.

Mechanical Division, signifies that separation which is occasioned in the parts of a body by help of mechanical instruments.—The mechanical division of bodies does.

Division. does indeed separate them into smaller, homogeneous, similar parts; but this separation cannot extend to the primary integrant molecules of any body; and consequently is incapable of breaking what is properly called their *aggregation*: also, no union is formed betwixt the divided and dividing bodies, in which respect division essentially differs from dissolution.

Division is not properly a chemical operation. It is only employed preparatorily to facilitate other operations, and particularly solution. For this purpose it is very useful, as it increases the quantity of surface, and consequently the points of contact of any body.—Different methods are used to divide bodies according to their nature. Those which are tenacious and elastic, as horns and gums, require to be cut, rasped, or filed. Metals, because of their ductility, require the same treatment: but as they are also fusible, they may be quickly and conveniently reduced into grains small enough for most operations, by pouring them, when melted, into water. All brittle bodies may be reduced conveniently into fine parts by being bruised in a mortar with a pestle. Very hard bodies, such as glass, crystals, stones, particularly those of the vitrifiable kind, before they are pounded, ought to be plunged when red-hot into water, by which they are split and cracked, and rendered more easily pulverable. Bodies of this kind may also be bruised or ground by means of a hard and flat stone, upon which the matter is to be put, and bruised by another hard stone so small as to be held and moved upon the larger stone with the hand. The larger stone is called a *porphyry*, from its being generally of that kind of stone; and the operation is called *porphyrisation*. Instead of porphyrisation, a mill may be used, composed of a hard grit millstone, moving round upon another stone of the same kind, which must be fixed: in the upper stone is a groove or channel, through which the matter to be ground passes. By this method a substance may be more quickly reduced to a fine powder than by porphyrisation. But these mills can be only employed for considerable quantities of matter.

These methods of mechanically dividing bodies are attended with some practical inconveniences; the most considerable of which is, that some parts of the dividing instruments are always struck off, and mixed with the matter to be divided. This may greatly affect the operations. For instance, instruments of iron and copper furnish metallic colouring particles, and copper is very prejudicial to health. Porphyry is coloured by a reddish brown matter, which injures the colour of crystal glasses, enamels, and porcelains made with matters ground upon this stone. These matters therefore must be cleansed after their porphyrisation, or else no instruments capable of injuring the intended operations ought to be employed. Thus, for the preparation of all medicines to be taken internally, no copper instruments, as mortars, pestles, &c. ought to be used; those made of iron are preferable; and instead of porphyries, mortars, grinding-stones and millstones made of hard and white stones ought to be employed for substances which are to enter into the composition of enamels, crystal glass, and porcelain, the whiteness of which is a most necessary quality.

DIVISION, in algebra. See ALGEBRA, p. 402.

Nº 102.

DIVISION, in arithmetic. See ARITHMETIC, nº 11. *Divisions of an Army*, in the military art, the several brigades and squadrons into which it is cantoned. *Division* || *Divorce.*

DIVISIONS of a Battalion, are the several platoons into which it is divided in marching or firing, each of which is commanded by an officer.

DIVISION, in sea affairs, a select number of ships in a fleet or squadron of men of war, distinguished by a particular flag or pendant, and usually commanded by a general officer. A squadron is commonly ranged into three divisions, the commanding officer of which is always stationed in the centre.

When a fleet consists of 60 sail of the line, that is, of ships having at least 60 cannon each, the admiral divides it into three squadrons, each of which has its divisions and commanding officers. Each squadron has its proper colours, according to the rank of the admiral who commands it, and every division its proper mast. Thus the white flag denotes the first division of France; the white and blue the second; and the third is characterised by the blue. In Britain, the first admiral, or the admiral of the fleet, displays the union-flag at the main-top-mast head; next follows the white flag with St George's cross; and afterwards the blue. The private ships carry pendants of the same colour with their respective squadrons at the mast of their particular divisions; so that the last ship in the division of the blue squadron carries a blue pendant at her mizen-top-mast head.

DIVISOR, in arithmetic. See ARITHMETIC, nº 11.

DIUM (anc. geog.), a town of Chalcidice in Macedonia, near mount Athos. Also a promontory of Crete, on the north side of the island.—A third *Dium*, a promontory of Eubœa; or a town of that name in Eubœa, near the promontory Cenæum, on the north-west side of the island, called also *Dia*.—A fourth *Dium* in Pieria of Macedonia, on the west side of the Sinus Thermaicus. Strabo and Livy place it on the borders of Pieria to the south, at the foot of mount Olympus towards Thessaly. That it was a splendid city, appears from Polybius; who relates, that its gymnasium and walls were overthrown by the Ætolians. From which overthrow, however, it again recovered, Alexander adding new splendor to it, by the brass statues cast by Lysippus, and erected there in memory of the slain at the Granicus: an ornament which was continued down to the time of the Romans; who made it a colony, called *Dienfis*.—A fifth *Dium* beyond Jordan, near Pella in the Piræa.

DIVODURUM (anc. geog.), a town of the Mediomatrici in Gallia Belgica; situated on the Moselle, in the spot where now Metz stands: now a city of Lorraine. E. Long. 6. o. Lat. 49. 16.

DIVORCE, a breach or dissolution of the bond of marriage. See MARRIAGE; and LAW, Nº clx. 23.

Divorce is of two kinds: the one, a *vinculo matrimonii*, which alone is properly *divorce*; the other, a *mensa & thoro*, “a separation from bed and board.”

The woman divorced a *vinculo matrimonii* receives all again that she brought with her: the other has a suitable separate maintenance allowed her out of her husband's effects. The first only happens thro' some essential impediment, as consanguinity or affinity within the degrees forbidden,

Divorce. forbidden, pre-contract, impotency, adultery, &c. of which impediments the canon law allows 14, comprehended in these verses :

*Error, conditio, votum, cognatio, crimen,
Cultus, disparitas, vis, ordo, ligamen, honestas,
Si sis affinis, si forte coire nequibis,
Si parochi & duplicis desit presentia testis,
Raptave sit mulier, nec parii reddita tuta.*

Divorce is a spiritual judgment, and therefore is passed in the spiritual court. Under the old law, the woman divorced was to have of her husband a writing, as St Jerom and Josephus testify, to this effect: *I promise, that hereafter I will lay no claim to thee*; which was called a *bill of divorce*.

Divorce was allowed of in great latitude both among the pagans and Jews. At Rome, barrenness, age, disease, madness, and banishment, were the ordinary causes of divorce. Spurius Carvilius, between 500 and 600 years after the building of Rome, under the consulship of M. Attilius, and P. Valerius, was the first who put away his wife because she was barren; though Plutarch, in his *Roman Questions*, maintains, that Domitian was the first who permitted divorce. Justinian afterwards added impotence, a vow of chastity, and the profession of a monastic life, as valid reasons of divorce.

The Roman lawyers distinguish between *repudium* and *divortium*; making the former to be the breaking of a contract or espousal, and the latter separation after matrimony. Romulus enacted a severe law, which suffered not a wife to leave her husband, but gave the man the liberty of turning off his wife, either upon poisoning her children, counterfeiting his private keys, or for the crime of adultery; but if the husband on any other occasion put her away, he ordered one moiety of his estate for the wife, and the other to the goddess Ceres: besides an atonement to the gods of the earth. However, in later times, the women as well as the men might sue a divorce. The common way of divorcing was by sending a bill to the woman, containing the reasons of separation, and the tender of all her goods which she brought with her: and this was called *repudium mittere*; or else it was performed in her presence, and before seven witnesses, and accompanied with the formalities of tearing the writings, refunding the portion, taking away the keys, and turning the woman out of doors.

The Grecian laws concerning divorces were different: The Cretans allowed divorce to any man that was afraid of having too many children. The Spartans seldom divorced their wives; and it was extremely scandalous for a woman to depart from her husband. The Athenians allowed divorce on very small grounds, by a bill, containing the reason of the divorce, and approved, if the party appealed, by the chief magistrate; and women also were allowed to leave their husbands on just occasions. Persons divorcing their wives were obliged to return their portions; otherwise, the Athenian laws obliged them to pay nine oboli a month for alimony. The terms expressing the separation of men and women from each other were different; the men were said *αποπεμπειν* or *απολειπειν*, to dismiss their wives; but wives, *απολειπειν*, to leave their husbands.

“The law of Moses (Mr Paley observes), for rea-
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sons of local expediency, permitted the Jewish husband to put away his wife; but whether for every cause, or for what cause, appears to have been controverted amongst the interpreters of those times. Christ, the precepts of whose religion were calculated for more general use and observation, revokes this permission, as given to the Jews ‘for their hardness of hearts,’ and promulges a law which was thenceforward to confine divorces to the single cause of adultery in the wife: ‘Whosoever shall put away his wife, except it be for fornication, and shall marry another, committeth adultery; and who so marrieth her which is put away, doth commit adultery.’ Matt. xix. 9.

“Inferior causes may justify the separation of husband and wife, although they will not authorise such a dissolution of the marriage contract as would leave either at liberty to marry again: for it is that liberty in which the danger and mischief of divorces principally consist. The law of this country, in conformity to our Saviour’s injunction, confines the dissolution of the marriage contract to the single case of adultery in the wife; and a divorce even in that case can only be brought about by the operation of an act of parliament, founded upon a previous sentence in the spiritual court, and a verdict against the adulterer at common law: which proceedings taken together compose as complete an investigation of the complaint as a cause can receive. It has lately been proposed to the legislature to annex a clause to these acts, restraining the offending party from marrying with the companion of her crime, who by the course of proceeding is always known and convicted: for there is reason to fear, that adulterous connections are often formed with the prospect of bringing them to this conclusion; at least, when the seducer has once captivated the affection of a married woman, he may avail himself of this tempting argument to subdue her scruples, and complete his victory; and the legislature, as the business is managed at present, assists by its interposition the criminal design of the offenders, and confers a privilege where it ought to inflict a punishment. The proposal deserved an experiment; but something more penal, it is apprehended, would be found necessary to check the progress of this alarming depravity. Whether a law might not be framed, directing the fortune of the adulteress to descend as in case of her natural death; reserving, however, a certain proportion of the produce of it, by way of annuity, for her subsistence (such annuity in no case to exceed a certain sum); and also so far suspending the estate in the hands of the heir, as to preserve the inheritance to any children she might bear to a second marriage, in case there was none to succeed in the place of their mother by the first: whether such a law would not render female virtue in higher life less vincible, as well as the seducers of that virtue less urgent in their suit, I would recommend to the deliberation of those who are willing to attempt the reformation of this important but most incorrigible class of the community. A passion for splendor, for expensive amusements and distinctions, is commonly found in that description of women who would become the subjects of such a law, not less inordinate than their other appetites. A severity of the kind proposed applies immediately to that passion. And there is no room for any complaint of injustice, since the provi-
K sions

Divorce.
Paley’s Moral and Political Philosophy, p. 273.

Diuretics
||
Dobson.

sions above stated, with others which might be contrived, confine the punishment, so far as it is possible, to the person of the offender; suffering the estate to remain to the heir, or within the family of the ancestor from whom it came, or to attend the appointments of his will.

"Sentences of the ecclesiastical courts, which release the parties *a vinculo matrimonii*, by reason of impuberty, frigidity, consanguinity within the prohibited degrees, prior marriage, or want of the requisite consent of parents or guardians, are not dissolutions of the marriage contract, but judicial declarations that there never was any marriage; such impediment subsisting at the time as rendered the celebration of the marriage rite a mere nullity. And the rite itself contains an exception of these impediments. The man and woman to be married are charged, "if they know any impediment why they may not be lawfully joined together, to confess it;" and assured, "that so many as are coupled together, otherwise than God's word doth allow, are not joined together by God, neither is their matrimony lawful;" all which is intended by way of solemn notice to the parties, that the vow they are about to make will bind their consciences and authorise their cohabitation only upon the supposition that no legal impediment exist."

DIURETICS (from *δια* by, and *ουρον* urine), medicines which provoke a discharge by urine.

Such is water drank plentifully; white wine drank in a morning; alkali salts of all kinds; sea-salt, sal-gemmæ, nitre, borax, alum, tartar, sal ammoniac, whey, sour milk, lemon-juice, &c. Aqueous liquors are generally diuretic especially if mixed with salt, and drank cold. Fermented liquors are the least diuretic of all; and the less so, as they are the fatter. Sharp thin sour wines, rhenish, &c. as also acid spirits of vinegar, salt, sulphur, alum, vitriol, &c. asparagus, bitter almonds, smallage, eryngium, eupatorium, fassafra, &c. are all diuretics.

DIURNAL, in astronomy, something relating to day; in opposition to *nocturnal*, which regards the night.

DIVUS, DIVA, in antiquity, appellations given to men and women who had been deified, or placed in the number of the gods. See DEIFICATION, &c.

Hence it is, that on medals struck for the consecration of an emperor or empress, they give them the title of *divus* or *diva*: for example, DIVUS JULIUS. DIVO ANTONINO PIO. DIVO PIO. DIVO CLAUDIO. DIVA FAUSTINA AUG. &c.

DIZZINESS, in medicine. See VERTIGO.

DO, in music, a note of the Italian scale, corresponding to *ut* of the common gamut. See MUSIC.

DOBSON (William), an eminent English portrait and history painter, born at London in 1610. He served an apprenticeship with one Peck, a stationer and picture-dealer; and owed his improvement to the copying some pictures of Titian and Van Dyck, whose manner he always retained. He had farther obligations to the latter of these artists; for it is said, that a picture of his painting being exposed at a shop on Snow-hill, Van Dyck passing by was struck with it exceedingly; and inquiring after the author, found him at work in a poor garret. Van Dyck had the generosity to equip him in a manner suitable to his merit.

He presented him to king Charles I. who took him under his protection, kept him with him at Oxford all the time his majesty continued in that city, and not only sat to him several times for his picture, but caused the prince of Wales, prince Rupert, and most of the lords of his court, to do so too. Mr Dobson, however, being somewhat loose and irregular in his way of life, was far from improving the many opportunities he had of making his fortune; and died very poor in 1647, at his house in St Martin's Lane.

DOBUNI, or BODUNI; an ancient people of Britain, who possessed the territory which now forms the counties of Oxford and Gloucester. Both the names of this British nation seem to have been derived from the low situation of a great part of the country which they inhabited: for both *Durn* and *Bodun* signify "profound" or "low", in the ancient language of Gaul and Britain. The Dobuni are not mentioned among the British nations who resisted the Romans under Julius Cæsar, which was probably owing to the distance of their country from the scene of action; and before the next invasion under Claudius, they had been so much oppressed by their ambitious neighbours the Cattivellauni, that they submitted with pleasure to the Romans, in order to be delivered from that oppression. Cogidunus, who was at that time (as his name imports) prince of the Dobuni, recommended himself so effectually to the favour of the emperor Claudius, by his ready submission, and other means, that he was not only continued in the government of his own territories, but had some other states put under his authority. This prince lived so long, and remained so steady a friend and ally to the Romans, that his subjects, being habituated to their obedience in his time, never revolted, nor stood in need of many forts or forces to keep them in subjection. This is certainly the reason that we meet with so few Roman towns and stations in the country anciently inhabited by the Dobuni. The Durocornovium of Antoninus, and the Corinium of Ptolemy, are believed by antiquaries to have been the same place, the capital of the Dobuni, and situated at Cirencester, in Gloucestershire, where there are many marks of a Roman station. Clevum or Glevum, in the thirteenth iter of Antoninus, stood where the city of Gloucester now stands; and Abone, in the fourteenth iter, was probably situated at Avinton on the Severn. The country of the Dobuni was comprehended in the Roman province Britannia Prima.

DOCETÆ (from *δοκεῖν* to appear), in ecclesiastical history, the followers of Julius Cassianus, one of the Valentinian sect, towards the close of the second century, who revived a notion that had been adopted by a branch of the Gnostics, against whom St John, Ignatius, and Polycarp, had asserted the truth of the incarnation. They believed and taught, as their name imports, that the actions and sufferings of Jesus Christ were not in reality, but only in appearance.

DOCIMASIA, in Greek antiquity, a probation of the magistrates and persons employed in public business at Athens. It was performed publicly in the forum, where they were obliged to give account of themselves and their past life before certain judges. Among several questions proposed to them, we find the following: Whether they had been dutiful to their parents,

Dobuni
||
Docimasia.

Docimastic rents, had served in the wars, and had a competent estate?

||
Dock.

DOCIMASTIC ART, a name given to the art of assaying by operations in small, the nature and quantity of metallic or other matters which may be obtained from mineral or other compound bodies. See **REFINING** and **METALLURGY**.

DOCIMENUM MARMOR, a name given by the ancients to a species of marble of a bright and clear white, much used in large and sumptuous buildings, such as temples and the like. It had its name from *Docimenos*, a city of Phrygia, afterwards called *Synaia*; near which it was dug, and from whence it was sent to Rome. It was accounted little inferior to the Parian in colour, but not capable of so elegant a polish; whence it was less used by the statuary, or in other smaller works. The emperor Adrian is said to have used this marble in building the temple of Jupiter; and many others of the great works of the Romans are of it.

DOCK, in botany. See **RUMEX**.

Dock, in the manege, is used for a large case of leather, as long as the dock of a horse's tail, which serves it for a cover. The French call the dock *trouffequue*. It is made fast by straps to the crupper, and has leathern thongs that pass between his thighs, and along his flanks to the saddle-straps, in order to keep the tail tight, and to hinder it from whisking about.

Dock, in maritime affairs, a sort of broad and deep trench, formed on the side of a harbour, or on the banks of a river; and commodiously fitted either to build ships or receive them to be repaired and *breamed* therein. These sorts of docks have generally strong flood-gates to prevent the flux of the tide from entering the dock while the ship is under repair.—There are likewise docks of another kind, called *wet docks*, where a ship can only be cleaned during the recess of the tide, or in the interval between the time when the tide left her dry a-ground and the period when it again reaches her by the return of the flood. Docks of the latter kind are not furnished with the usual flood-gates.

Dock-Yards, certain magazines containing all sorts of naval stores and timber for ship-building. In England, the royal dock-yards are at Chatham, Portsmouth, Plymouth, Deptford, Woolwich, and Sheerness. His majesty's ships and vessels of war are generally moored at these ports during the time of peace; and such as want repairing are taken into the docks, examined, and refitted for service.

The principal dock-yards are governed by a commissioner, resident at the port; who superintends all the musters of the officers, artificers, and labourers, employed in the dock-yard and ordinary. He also controls their payment therein; examines the accounts; contracts, and draws bills on the navy-office to supply the deficiency of stores; and, finally, regulates whatever belongs to the dock-yard, maintaining due order in the respective offices.

These yards are generally supplied from the northern crowns with hemp, pitch, tar, rosin, canvas, oak-plank, and several other species. With regard to the masts, particularly those of the largest size, they are usually imported from New-England.

DOCTOR, a person who has passed all the degrees of a faculty, and is empowered to teach or practise the same: thus we say, doctor in divinity, doctor in physic, doctor of laws.

The establishment of the *doctorate*, such as now in use among us, is ordinarily attributed to Irnerius, who himself drew up the formulary. The first ceremony of this kind was performed at Bologna, in the person of Bulgarus, who began to profess the Roman law, and on that occasion was solemnly promoted to the *doctorate*, i. e. installed *juris utriusque doctor*. But the custom was soon transferred from the faculty of law to that of theology; the first instance whereof was given in the university of Paris, where Peter Lombard and Gilbert de la Portree, the two chief divines of those days, were created doctors in theology, *sacra theologiae doctores*.

Spelman takes the title of doctor not to have commenced till after the publication of Lombard's sentences, about the year 1140; and affirms, that such as explained that work to their scholars were the first that had the appellation of doctors. Others go much higher, and hold Bede to have been the first doctor at Cambridge, and John de Beverley at Oxford, which latter died in the year 721. But Spelman will not allow doctor to have been the name of any title or degree in England till the reign of king John, about the year 1207.

To pass doctor in divinity at Oxford, it is necessary the candidate have been four years bachelor of divinity. For doctor of laws, he must have been seven years in the university to commence bachelor of law; five years after which he may be admitted doctor of laws. Otherwise, in three years after taking the degree of master of arts, he may take the degree of bachelor in law; and in four years more, that of LL. D. which same method and time are likewise required to pass the degree of doctor in physic.

At Cambridge, to take the degree of doctor in divinity, it is required the candidate have been seven years bachelor of divinity. Though in several of the colleges the taking of the bachelor of divinity's degree is dispensed with, and they may go out *per saltum*. To commence doctor in laws, the candidate must have been five years bachelor of law, or seven years master of arts. To pass doctor in physic, he must have been bachelor in physic five years, or seven years master of arts. A doctor of the civil law may exercise ecclesiastical jurisdiction, though a layman, stat. 37 Hen. VIII. cap. 17. sect. 4.

Doctor of the Law, a title of honour among the Jews. The investiture, if we may so say, of this order was performed by putting a key and table-book in their hands; which is what some authors imagine our Saviour had in view, Luke xi. 52. when, speaking of the doctors of the law, he says, "Wo unto you doctors of the law, for you have taken away the key of knowledge: you entered not in yourselves, and them that were entering you hindered."

Doctor of the Church, a title given to certain of the fathers whose doctrines and opinions have been the most generally followed and authorised. We usually reckon four doctors of the Greek church, and three of the Latin. The first are St Athanasius, St Basil, St Gregory Nazianzen, and St Chrysostom. The latter are

Document
11
Dodd.

St Jerom, St Augustine, and Gregory the Great. In the Roman breviary there is a particular office for the doctors. It only differs from that of the confessors, by the anthem of the Magnificat, and the lessons.

DOCTOR, is also an appellation adjoined to several specific epithets, expressing the merit of some of the schoolmen: thus, Alexander Hales is called the irrefragable doctor; Thomas Aquinas, the angelic doctor; St Bonaventure, the seraphic doctor; John Duns Scotus, the subtle doctor; Raimond Lully, the illuminated doctor; Roger Bacon, the admirable doctor, &c.

DOCTOR, *Διδασκαλος*, in the Greek church, is a particular officer, appointed to interpret part of the scriptures. He who interprets the Gospels, is called *doctor of the Gospels*; he who interprets St Paul's Epistles, *doctor of the Apostle*; he who interprets the Psalms, *doctor of the Psalter*.

DOCTORS-Commons. See COLLEGE of Civilians.

DOCUMENT, in law, some written monument produced in proof of any thing asserted.

DODARTIA, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 40th order, *Personata*. The calyx is quinque-dentate; the under lip of the corolla twice as long as the upper; the capsule bilocular and globose.

DODD (Dr William), an unfortunate English divine, eldest son of the Rev. William Dodd, many years vicar of Bourne in Lincolnshire, was born May 29. 1729. He was sent, at the age of 16, to the university of Cambridge; and admitted, in the year 1745, a sizar of Clare-Hall. In 1749-50 he took the degree of B. A. with great honour, being upon that occasion in the list of wranglers. Leaving the university, he imprudently married a Miss Mary Perkins in 1751, was ordained a deacon the same year, priest in 1753, and soon became a celebrated and popular preacher. His first preferment was the lectureship of West-Ham. In 1754 he was also chosen lecturer of St Olave's, Hart-Street; and in 1757 took the degree of M. A. at Cambridge. On the foundation of the Magdalen Hospital in 1758, he was a strenuous supporter of that charity, and soon after became preacher at the chapel of it. By the patronage of Bishop Squire, he in 1763 obtained a prebend of Brecon, and by the interest of some city-friends procured himself to be appointed one of the king's chaplains; soon after which, he had the education of the present earl of Chesterfield committed to his care. In 1766 he went to Cambridge and took the degree of LL. D. At this period, the estimation in which he was held by the world was sufficient to give him expectations of preferment, and hopes of riches and honours; and these he might probably have acquired, had he possessed a common portion of prudence and discretion. But, impatient of his situation, and eager for advancement, he rashly fell upon means which in the end were the occasion of his ruin. On the living of St George, Hanover-Square, becoming vacant, he wrote an anonymous letter to the chancellor's lady, offering 3000 guineas if by her assistance he was promoted to it. This being traced to him, complaint was immediately made to the king, and Dr Dodd was dismissed with disgrace from his office of chaplain. From this period he lived neglected, if not despised;

and his extravagance still continuing, he became involved in difficulties, which tempted him to forge a bond from his late pupil lord Chesterfield, Feb. 4. 1777, for L. 4200, which he actually received: but being detected, he was tried at the Old Bailey, found guilty, and received sentence of death; and, in spite of every application for mercy, was executed at Tyburn, June 27. 1777. Dr Dodd was a voluminous writer, and possessed considerable abilities, with little judgment and much vanity. An accurate list of his various writings is prefixed to his "Thoughts in Prison," ed. 1781.

DODDER, in botany. See CUSCUTA.

DODDRIDGE (Philip), D. D. an eminent Presbyterian minister, was the son of Daniel Doddridge an oil-man in London, where he was born on the 26th of June 1702; and having completed the study of the classics in several schools, was, in 1719, placed under the tuition of the reverend Mr John Jennings, who kept an academy at Kilworth in Leicestershire. He was first settled as a minister at Kilworth, where he preached to a small congregation in an obscure village: but, on Mr Jennings's death, succeeded to the care of his academy; and soon after was chosen minister of a large congregation of Dissenters at Northampton, to which he removed his academy, and where the number of his pupils increased. He instructed his pupils with the freedom and tenderness of a father; and never expected nor desired that they should blindly follow his sentiments, but encouraged them to judge for themselves. He checked any appearance of bigotry and uncharitableness, and endeavoured to cure them by showing what might be said in defence of those principles they disliked. He died at Lisbon, whither he went for the recovery of his health; and his remains were interred in the burying-ground belonging to the British factory there, and a handsome monument was erected to his memory in the meeting-house at Northampton, at the expence of the congregation, on which is an epitaph written by Gilbert West, Esq. He wrote, 1. Free Thoughts on the most probable means of reviving the Dissenting Interest. 2. The Life of Colonel James Gardiner. 3. Sermons on the Education of Children. 4. The Rise and Progress of Religion in the Soul. 5. The Family Expositor, in 6 vols 4to, &c. And since the author's death, a volume of his Hymns have been published, and his Theological Lectures. Several of his works have been translated into Dutch, German, and French.

DODECAGON, in geometry, a regular polygon consisting of twelve equal sides and angles.

DODECAHEDRON, in geometry, one of the platonic bodies, or regular solids, contained under twelve equal and regular pentagons.

DODECANDRIA (from *δωδεκα* twelve, and *ανρ* a man); the name of the eleventh class in Linnæus's sexual system, consisting of plants with hermaphrodite flowers, that, according to the title, have twelve stamina or male organs. This class, however, is not limited with respect to the number of stamina. Many genera have sixteen, eighteen, and even nineteen stamina; the essential character seems to be, that, in the class in question, the stamina, however numerous, are inserted into the receptacle: whereas in the next class, icosandria, which

Dodder
11
Dodecan-
dria.

Nichol's
Anecdotes of
Boyer.

Dodecas which is as little determined in point of number as the present, they are attached to the inside of the calyx or flower-cup.

Dodona.

The orders in this class, which are fix, are founded upon the number of the styles, or female organs. A-farabacca, mangostan, storax, purple loose-strife, wild Syrian rue, and purslane, have only one style; agrimony and heliocarpus have two; burning thorny plant, and bastard rocket, three; *glinus*, five; *illicium*, eight; and house-leek, twelve.

DODECAS, in botany: A genus of the trigynia order, belonging to the dodecandria class of plants. The calyx is half quadrifid, having the corolla above; the corolla quinquefid; the capsule unilocular, conjoined with the calyx.

DODECATHÉON, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 21st order, *Precia*. The corolla is verticillated and reflexed; the stamina placed in the tube; the capsule unilocular and oblong.

DODO, in ornithology. See **DIDUS**.

DODONA, a town of Thesprotia in Epirus, or (according to others) in Thessaly. There was in its neighbourhood a celebrated oracle of Jupiter. The town and temple of the god were first built by Deucalion, after the universal deluge. It was supposed to be the most ancient oracle of all Greece; and according to the traditions of the Egyptians mentioned by Herodotus, it was founded by a dove. Two black doves, as he relates, took their flight from the city of Thebes in Egypt; one of which flew to the temple of Jupiter Ammon, and the other to Dodona, where with an human voice they acquainted the inhabitants of the country that Jupiter had consecrated the ground, which in future would give oracles. The extensive grove which surrounded Jupiter's temple was endowed with the gift of prophecy; and oracles were frequently delivered by the sacred oaks and the doves which inhabited the place. This fabulous tradition of the oracular power of the doves is explained by Herodotus, who observes that some Phenicians carried away two priestesses from Egypt, one of which went to fix her residence at Dodona, where the oracle was established. It may farther be observed, that the fable might have been founded upon the double meaning of the word *τελειαι*, which signifies *doves* in most parts of Greece, while in the dialect of the Epirots it implies *old women*. In ancient times the oracles were delivered by the murmuring of a neighbouring fountain; but the custom was afterwards changed. Large kettles were suspended in the air near a brazen statue, which held a lash in its hand. When the wind blew strong, the statue was agitated and struck against one of the kettles, which communicated the motion to all the rest, and raised that clattering and discordant din, which continued for a while, and from which the artifice of the priests drew the predictions. Some suppose that the noise was occasioned by the shaking of the leaves and boughs of an old oak, which the superstition of the people frequently consulted, and from which they pretended to receive oracles. It may be observed with more probability, that the oracles were delivered by the priests, who, by artfully concealing themselves behind the oaks, gave occasion to the super-

stitious multitude to believe that the trees were endowed with the power of prophecy. As the ship Argo was built with some of the oaks of the forest of Dodona, there were some beams which gave oracles to the Argonauts, and warned them against the approach of calamity. Within the forest of Dodona there was a stream and a fountain of cool water which had the power of lighting a torch as soon as it touched it. This fountain was totally dry at noon day, and was restored to its full course at midnight, from which time till the following noon it began to decrease, and at the usual hour was again deprived of its waters. The oracles of Dodona were generally delivered by women.

DODONÆA, in botany: A genus of the monogynia order belonging to the octandria class of plants. The calyx is tetraphyllous; there is no corolla; the capsule trilocular and inflated; the seeds twofold.

DODONIAN, *Dodonæus*, in antiquity, an epithet given to Jupiter, because he was worshipped in a temple built in the forest of Dodona, where was the most famous, and (it is said) the most ancient, oracle of all Greece. See **DODONA**.

DODONIDES, the priestesses who gave oracles in the temple of Jupiter in Dodona. According to some traditions the temple was originally inhabited by seven daughters of Atlas, who nursed Bacchus. Their names were Ambrosia, Eudora, Pasithoe, Pytho, Plexaure, Coronis, Tythe or Tyche. In the later ages the oracles were always delivered by three old women; which custom was first established when Jupiter enjoyed the company of Dione, whom he permitted to receive divine honour in his temple at Dodona. The Boeotians were the only people of Greece who received their oracles at Dodona from men, for reasons which Strabo, l. 9. fully explains.

DODRANS, in antiquity, three-fourths of the as. See the article **As**.

DODSLEY (Robert), a late eminent bookseller, and ingenious writer, born at Mansfield in Nottinghamshire, in the year 1703. He was not indebted to education for his literary fame, being originally a livery servant; but his natural genius, and early passion for reading, soon elevated him to a superior station. He wrote an elegant little satirical farce called *The Toy-shop*, which was acted with applause in 1735, and which recommended him to the patronage of Mr Pope. The following year he produced the *King and Miller of Mansfield*. The profits of these two farces enabled him to commence bookseller, and his own merit procured him eminence in that profession. He wrote some other dramatic pieces, and published a collection of his works in one vol. 8vo, under the modest title of *Trifles*; which was followed by *Public Virtue*, a poem in 4to. Beside what he wrote himself, the public were obliged to him for exerting his judgment in the way of his business; he having collected several volumes of well chosen *Miscellaneous Poems* and *Fugitive Pieces*, whose brevity would else have endangered their being totally lost to posterity. He died in 1764.

DODWELL (Henry), a very learned controversial writer, born at Dublin, but of English extraction, in 1641. He wrote an incredible number of tracts: but his services were so little acknowledged, that bishop Burnet and others accuse him of doing more hurt than good.

Dodonæa

Dodwell.

Doelburg, good to the cause of Christianity, by his indiscreet love of paradoxes and novelties, and thus exposing himself to the scoffs of unbelievers. His pamphlet on the immortality of the soul gave rise to the well known controversy between Mr Collins and Dr Clark on that subject. He died in 1711.

DOESBURG, a town of the united provinces, in the county of Zutphen and province of Guelderland. It is small, but well peopled, and very strong both by art and nature, having the river Yssel on one side, and a morass on the other, and is only to be approached by a narrow neck of land. E. Long. 5. 55. N. Lat.

52. 3.

DOG, in zoology: An animal remarkable for its natural docility, fidelity, and affection for its master; which qualities mankind are careful to improve for their own advantage. These useful creatures guard our houses, gardens, and cattle, with spirit and vigilance. By their help we are enabled to take not only beasts, but birds; and to pursue game both over land and through the waters. In some northern countries, they serve to draw sleds, and are also employed to carry burdens. In several parts of Africa, China, and by the West Indian negroes, dogs are eaten, and accounted excellent food. Nay, we have the testimony of Mr Forster, that dogs flesh, in taste, exactly resembles mutton*. They were also used as food by the Romans, and long before them by the Greeks, as we learn from several treatises of Hippocrates. In the present times, their skins, dressed with the hair on, are used in muffs, made into a kind of buskins for persons in the gout, and for other purposes. Prepared in another way, they are used for ladies gloves, and the linings of masks, being thought to make the skin peculiarly white and smooth. The French import many of these skins from Scotland, under a small duty. Here, when tanned, they serve for upper leathers for neat pumps. Dogs skins dressed are exported under a small, and imported under a high, duty. The French import from Denmark large quantities of dogs hair, both white and black. The last is esteemed the best, and is worked up in the black list of a particular kind of woollen cloth; but is not used, as many have supposed, in making of hats, being entirely unfit for this purpose.

* See *America*, n° 90.

With regard to the qualities of dogs, those bred in the island of Britain are justly reckoned superior to the dogs bred in any other country. The swiftness of the greyhound is amazing: as are also the steadiness and perseverance of other hounds and beagles; the boldness of terriers in unearthing foxes, &c.; the sagacity of pointers and setting dogs, who are taught a language by signs as intelligible to sportsmen as speech; and the invincible spirit of a bull-dog, which can be quelled only by death.—All the nations in Europe not only do justice to the superior qualities of the British dogs, but adopt our terms and names, and thankfully receive the creatures as presents.—It is remarkable, however, that almost every kind of British dogs degenerates in foreign countries; nor is it possible to prevent this degeneracy by any art whatever.

For the natural history of the dog, see **CANIS**.

Choosing of Dogs. In order to choose a dog and bitch for good whelps, take care that the bitch come of a generous kind, be well proportioned, having large ribs and flanks; and likewise that the dog be of a good

breed and young, for a young dog and an old bitch breed excellent whelps.

The best time for hounds nitches, or bratchets, to be lined in, are the months of January, February, and March. The bitch should be used to a kennel, that she may like it after her whelping, and she ought to be kept warm. Let the whelps be weaned after two months old; and though it be some difficulty to choose a whelp under the dam that will prove the best of the litter, yet some approve that which is last, and account him to be the best. Others remove the whelps from the kennel, and lay them severally and apart one from the other; then they watch which of them the bitch first takes and carries into her kennel again, and that they suppose to be the best. Others again imagine that which weighs least when it sucks to be the best: this is certain, that the lighter whelp will prove the swifter. As soon as the bitch has littered, it is proper to choose them you intend to preserve, and drown the rest: keep the black, brown, or of one colour; for the spotted are not much to be esteemed, though of hounds the spotted are to be valued.

Hounds for chase are to be chosen by their colours. The white, with black ears, and a black spot at the setting on of the tail, are the most principal to compose a kennel of, and of good scent and condition. The black hound, or the black tanned, or the all liver-coloured, or all white: the true talbots are the best for the stronger line; the grizzled, whether mixed or unmixed, so they be shag-haired, are the best verminers, and a couple of these are proper for a kennel.—In short, take these marks of a good hound: That his head be of a middle proportion, rather long than round; his nostrils wide, his ears large, his back bowed; his fillet great, his haunches large, thighs well trussed, ham strait, tail big near the reins, the rest slender; the leg big, the sole of the foot dry, and in the form of that of a fox, with large claws.

Keeping Dogs in Health.—As pointers and spaniels, when good of their kinds and well broken, are very valuable to a sportsman, it is worth while to take some care to preserve them in health. This very much depends on their diet and lodging: frequent cleaning their kennels, and giving them fresh straw to lie on, is very necessary; or, in summer-time, deal-shavings, or sand, instead of straw, will check the breeding of fleas. If you rub your dog with chalk, and brush and comb him once or twice a-week, he will thrive much the better; the chalk will clear his skin from all greasiness, and he will be the less liable to be mangy. A dog is of a very hot nature: he should therefore never be without clean water by him, that he may drink when he is thirsty. In regard to their food, carrion is by no means proper for them: it must hurt their sense of smelling, on which the excellence of these dogs greatly depends. Barley-meal, the dross of wheat flour, or both mixed together, with broth or skimmed milk, is very proper food. For change, a small quantity of greaves from which the tallow is pressed by the chandlers, mixed with flour, or sheep's feet well baked or boiled, are a very good diet; and when you indulge them with flesh, it should always be boiled. In the season of hunting your dogs, it is proper to feed them in the evening before, and give them nothing in the morning you intend to take them

out

Dog. out except a little milk. If you stop for your own refreshment in the day, you should also refresh your dogs with a little bread and milk. It has been already observed that dogs are of a hot constitution; the greatest relief to them in the summer is twitch-grass, or dog-grass, which is the same thing. You should therefore plant some of it in a place where you can turn them into every morning: they will feed freely on it to be cured of the sickness they are subject to, and cured of any extraordinary heat of blood: but unless the grass be of this sort, it will have no effect.

*Sportsman's
Diet.*

Diseases of Dogs.—1. *Bites and Stings.* If dogs are bitten by any venomous creatures, as snakes,adders, &c. squeeze out the blood, and wash the place with salt and urine; then lay a plaster to it made of calamint, pounded in a mortar, with turpentine and yellow wax, till it come to a salve. If you give your dog some of the juice of calamint to drink in milk, it will be good; or an ounce of treacle dissolved in some sweet wine.

2. *Mange.* Dogs are subject to the mange from being fed too high, and allowed no exercise or an opportunity of refreshing themselves with dog-grass; or by being starved at home, which will cause them to eat the vilest stuff abroad, such as carrion, or even human excrement; or by want of water, and sometimes by not being kept clean in their kennel, or by foundering and melting in their grease. Either of these will heat the blood to a great degree, which will have a tendency to make them mangy. The cure may be effected by giving stone-brimstone powdered fine, either in milk or mixed up with butter, and rubbing them well every day for a week with an ointment made of some of the brimstone and pork-lard, to which add a small quantity of oil of turpentine.—Or, boil four ounces of quicksilver in two quarts of water to half the quantity; bathe them every day with this water, and let them have some of it to lick till the cure is perfected. Or, a small quantity of trooper's ointment rubbed on the parts on its first appearance will cure it. It will also free lousy puppies from their lice. Or, take two ounces of euphorbium; flour of sulphur, Flanders oil of bays, and soft soap, each four ounces. Anoint and rub your dog with it every other day; give him warm milk, and no water. The cure will be performed in about a week. The following receipt is also said to be efficacious. Take two handfuls of wild cresses, and as much elecampane, and also of the leaves and roots of roerb and sorrel, and two pounds of the roots of foderls: boil all these well together in lee and vinegar; strain the decoction, and put into it two pounds of grey soap, and when it is melted, rub the dog with it four or five days successively, and it will cure him.

3. *Poison.* If you suspect your dog to be poisoned with nux vomica (the poison usually employed by the warreners, which causes convulsive fits and soon kills), the most effectual remedy, if immediately applied, is to give him a good deal of common salt; to administer which, you may open his mouth, and put a stick across to prevent the shutting it, whilst you cram his throat full of salt, at the same time holding his mouth upwards; and it will dissolve so that a sufficient quantity will be swallowed to purge and vomit him. When his stomach is sufficiently cleared by a

free passage obtained by stool, give him some warm broth frequently, to prevent his expiring from faintness; and he will recover.

Dog.

*Sportsman's
Diet.*

4. *Worms.* Dogs are very frequently troubled with worms; but more particularly whilst they are young. Any thing bitter is so nauseous to these worms, that they are very often voided by taking two or three purges of aloes; or (which is the same thing) Scots pills, four or five being a dose for a large dog: this is to be repeated two or three times in a week. If this do not succeed, you may give him an ounce of powder of tin mixed up with butter, in three doses; which seldom fails to cure. Or of the herb savin, dried and rubbed to powder, give about as much as will lie on a shilling for a dose; which will entirely destroy worms and their seed.

6. *Sore Feet.* A pointer ought not to be hunted oftener than two or three days in a week; and unless you take care of his feet, and give him good lodging as well as proper food, he will not be able to perform that through the season. You should therefore, after a hard day's hunting, wash his feet with warm water and salt; and when dry, wash them with warm broth, or beer and butter, which will heal their soreness, and prevent a settled stiffness from fixing.

7. *Strains, Blows, or small Wounds.* If your dog has received any little wounds by forcing through hedges, or gets any lameness from a blow or strain; bathe the wound or grieved part with salt and cold vinegar (for warming it only evaporates the fine spirit); and when dry, if a wound, you may pour in it a little friar's balsam, which will perform the cure sooner than any method hitherto experienced.

8. *Coughs and Colds.* Dogs are very subject to a cough, with an extraordinary choking, which is thought to arise generally from a cold or some inward disorder; and probably it is often occasioned by their eating of fish-bones. To guard against it, order your servants to throw all such fish-bones where the dog can't get at them. But if the disorder be from a cold, let bleeding be repeated in small quantities, if necessary; but if it be what is called the *distemper* in dogs, and they appear to be very low in spirits, the bleeding is better omitted. Let meat-broth, or milk-broth warmed, be the principal part of his diet, using at the same time the following medicine. Take flour of sulphur, cold drawn linseed oil, and salt-petre, of each an ounce; divide it into four doses, giving him one dose every other day, and let him have plenty of clean straw to lie on; or one spoonful of honey daily.

Dog-Madness. Of this there are no less than seven sorts common among dogs. The chief causes are, high-feeding, want of exercise, fulness of blood, and coitiveness. As for the two first, you must observe when you hunt them, that they should be better fed than when they rest; and let them be neither too fat nor too lean; but, of the two, rather fat than lean; by which means they will not only be preserved from madness but also from the mange and scab: which diseases they will be subject to for want of air, water, or exercise; but if you have but the knowledge to keep them in an even temper, they may live long, and continue sound. As for water, they should be left to their own pleasure; but for exercise and diet, it must be ordered according to discretion, observing a medium.

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um. Give them once a week, especially in the heat of the year, five or six spoonfuls of salad oil, which will cleanse them: at other times, the quantity of a hazelnut of mithridate is an excellent thing to prevent diseases. It is also very good to bleed them under the tongue, and behind the ears.

The symptoms of madness are many and easily discerned. When any dog separates himself contrary to his former use, becomes melancholy or droops his head, forbears eating, and as he runs snatches at every thing; if he often looks upwards, and his stern at his setting on be a little erect, and the rest hanging down; if his eyes be red, his breath strong, his voice hoarse, and he drivels and foams at the mouth; you may be assured he has this distemper.

The seven sorts of madness are as follow; of which the two first are incurable. 1. The hot burning madness. 2. The running madness. The animals labouring under these are peculiarly dangerous; for all things they bite and draw blood from will have the same distemper; and they generally seize on all they meet with, but chiefly on dogs: their pain is so great it soon kills them.—The five curable madnesses are,

3. *Sleeping madness*, so called from the dog's great drowsiness, and almost continual sleeping. This is caused by the little worms that breed in the mouth of the stomach, from corrupt humours, vapours, and fumes which ascend to the head: for cure of which, take six ounces of the juice of wormwood, two ounces of the powder of hartshorn burnt, and two drams of agaric; mix all these together in a little white-wine, and give it the dog to drink in a drenching horn.

4. *Dumb madness*, lies also in the blood, and causes the dog not to feed, but to hold his mouth always wide open, frequently putting his feet to his mouth, as if he had a bone in his throat: to cure this, take the juice of black hellebore, the juice of *spatula putrida*, and of rue, of each four ounces; strain them well, and put thereto two drams of unprepared scammony; and being mixed well together, put it down the dog's throat with a drenching horn, keeping his head up for some time, lest he cast it out again; then bleed him in the mouth, by cutting two or three veins in his gums.

It is said, that about eight drams of the juice of an herb called *hartshorn*, or *dog's tooth*, being given to the dog, cures all sorts of madness.

5. *Lank madness*, is so called by reason of the dog's leanness and pining away. For cure give them a purge as before directed, and also bleed them: but some say there is no cure for it.

6. *Rheumatic or flavering madness*, occasions the dog's head to swell, his eyes to look yellow, and he will be always flavering and driveling at the mouth. To cure which, take four ounces of the powder of the roots of polipody of the oak, six ounces of the juice of fennel-roots, with the like quantity of the roots of mistletoe, and four ounces of the juice of ivy: boil all these together in white-wine, and give it to the dog as hot as he can take it, in a drenching horn.

7. *Falling madness*, is so termed because it lies in the dog's head, and makes him reel as he goes, and to fall down. For the cure, take four ounces of the juice of briony, and the same quantity of the juice of peony,

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with four drams of stavesacre pulverized; mix these together, and give it the dog in a drenching horn; also let him bleed in the ears, and in the two veins that come down his shoulders; and indeed bleeding is necessary for all sorts of madness in dogs.

When a dog happens to be bit by a mad one, there is nothing better than their licking the place with their own tongues, if they can reach it; if not, then let it be washed with butter and vinegar, made luke-warm, and let it afterwards be anointed with Venice turpentine; but, above all, take the juice of the stalks of strong tobacco boiled in water, and bathe the place therewith; also wash him in sea-water, or water artificially made salt: give him likewise a little mithridate inwardly in two or three spoonfuls of sack; and so keep him apart; and if you find him after some time still to droop, the best way is to hang him.

Some have asserted their having cured several creatures that have been bit by mad dogs, with only giving them the middle yellow bark of buckthorn; which must be boiled in ale for a horse or cow, and in milk for a dog; but that it must be boiled till it is as bitter as you can take it.

As to the preventive of worming dogs, see WORM-ING.

Dog-Days. See CANICULA.

Dog-Fish, in ichthyology. See SQUALUS.

Dogs-Bane. See APOCYNUM.

Dog-Wood Tree. See PISCIDIA.

DOGE, the chief magistrate in the republics of Venice and Genoa.

The word properly signifies *duke*, being formed from the Latin *dux*; as *dogate*, and *dogado*, from *ducatus*, "duchy."

The dogate, or office and dignity of doge, is elective; at Venice, the doge is elected for life; at Genoa, only for two years; he is addressed under the title of *Serenity*, which among the Venetians is superior to that of highness.

The doge is the chief of the council, and the mouth of the republic; yet the Venetians do not go into mourning at his death, as not being their sovereign, but only their first minister. In effect, the doge of Venice is no more than the phantom or shadow of the majesty of a prince; all the authority being reserved to the republic. He only lends his name to the senate; the power is diffused throughout the whole body, though the answers be all made in the name of the doge. If he gives any answers on his own account, they must be very cautiously expressed, and in general terms, otherwise he is sure to meet with a reprimand. So that it is absolutely necessary he be of an easy and pliable disposition.

Anciently the doges were sovereigns; but things are much altered; and at present, all the prerogatives reserved to the quality of doge, are these which follow: he gives audience to ambassadors; but does not give them any answer from himself, in matters of any importance; only he is allowed to answer according to his own pleasure, to the compliments they make to the signory; such answers being of no consequence. The doge, as being first magistrate, is head of all the councils; and the credentials which the senate furnishes its ministers in foreign courts, are written in his name;

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name; and yet he does not sign them; but a secretary of state signs them, and seals them with the arms of the republic. The ambassadors direct their dispatches to the doge; and yet he may not open them but in presence of the counsellors. The money is struck in the doge's name, but not with his stamp or arms. All the magistrates rise, and salute the doge when he comes into council; and the doge rises to none but foreign ambassadors.

The doge nominates to all the benefices in the church of St Mark; he is protector of the monastery delle Virgine; and bestows certain petty offices of ushers of the household, called *Commanders of the Palace*. His family is not under the jurisdiction of the master of the ceremonies; and his children may have staff-officers, and gondoliers in livery.

His grandeur, at the same time, is tempered with a variety of circumstances, which render it burdensome. He may not go out of Venice without leave of the council; and if he does go out, he is liable to receive affronts, without being intitled to demand satisfaction; and, if any disorder should happen where he was, it belongs not to him, but to the podesta, as being invested with the public authority, to compose it.

The children and brothers of the doge are excluded from all the chief offices of state. They may not receive any benefice from the court of Rome; but are allowed to accept of the cardinalate, as being no benefice, nor including any jurisdiction. The doge may not divest himself of his dignity, for his ease; and after his death, his conduct is examined by three inquisitors and five correctors, who sift it with great severity.

DOGGER, a Dutch fishing vessel navigated in the German Ocean. It is generally employed in the herring fishery; being equipped with two masts, viz. a main-mast and a mizen-mast, and somewhat resembling a ketch. See the Plates at the article SHIP.

DOGGERS, in the English alum works, a name given by the workmen to a sort of stone found in the same mines with the true alum rock, and containing some alum, though not near so much as the right kind. The county of York, which abounds greatly with the true alum rock, affords also a very considerable quantity of these doggers; and in some places they approach so much to the nature of the true rock, that they are wrought to advantage.

DOGMA, a principle, maxim, tenet, or settled opinion, particularly with regard to matters of faith and philosophy.

DOGMATICAL, something belonging to a doctrine or opinion. A dogmatical philosopher is one who asserts things positively; in opposition to a sceptic, who doubts of every thing.

DOGMATISTS, a sect of ancient physicians, of which Hippocrates was the first author. They are also called *logici*, "logicians," from their using the rules of logic in subjects of their profession. They laid down definitions and divisions; reducing diseases to certain genera, and those genera to species, and furnishing remedies for them all; supposing principles, drawing conclusions, and applying those principles and conclusions to particular diseases under consideration: in which sense, the dogmatists stand contradistinguished from em-

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pirics and methodists. They reject all medicinal virtues that they think not reducible to manifest qualities: but Galen hath long ago observed of such men, that they must either deny plain matter of fact, or assign but very poor reasons and causes of many effects they pretend to explain.

DOLCE (Carlo, or Carlino), a celebrated history and portrait painter, was born at Florence in 1616, and was the disciple of Vignali. This great master was particularly fond of representing pious subjects, though he sometimes painted portraits; and his works are easily distinguished by the peculiar delicacy with which he perfected all his compositions, by a pleasing tint of colour, and by a judicious management of the chiaro scuro. His performance was remarkably slow; and it is reported that his brain was fatally affected by seeing Luca Jordana dispatch more business in four or five hours than he could have done in as many months. He died in 1686.

DOLE, in the Saxon and British tongue, signified a part or portion, most commonly of a meadow, where several persons have shares. It also still signifies a distribution or dealing of alms, or a liberal gift made by a great man to the people.

DOLE, in Scots law, signifies a malevolent intention. It is essential in every crime, that it be committed intentionally, or by an act of the will: hence the rule, *Crimen dolo contrahitur*.

DOLICHOS, in botany: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The basis of the vexillum has two callous knobs, oblong, parallel, and compressing the alæ below. There are 25 species; the most remarkable of which are the following.

1. The lablab, with a winding stalk, is a native of warm climates, where it is frequently cultivated for the table. Mr Hasselquist informs us, that it is cultivated in the Egyptian gardens, but is not a native of that country. The Egyptians make pleasant arbours with it in their houses and gardens, by supporting the stem and leading it where they think proper. They not only support it with sticks and wood, but tie it with cords; by which means the leaves form an excellent covering, and an agreeable shade.

2. The soja is a native of Japan, where it is termed *daidzu*; and, from its excellence, *mame*; that is, "the legumen or pod," by way of eminence. It grows with an erect, slender, and hairy stalk, to the height of about four feet. The leaves are like those of the garden kidney-bean*. The flowers are of a bluish white, and produced from the bosom of the leaves, and succeeded by bristly hanging pods resembling those of the yellow lupine, which commonly contain two, sometimes three, large white seeds. There is a variety of this kind, with a small black fruit, which is used in medicine. Kempter affirms, that the seeds of this when pounded and taken inwardly give relief in the asthma. This legumen is doubly useful in the Japanese kitchens. It serves for the preparation of a substance named *miso*, that is used as butter; and likewise a pickle celebrated among them under the name of *soju* or *soy*. To make the first, they take a measure of mame, or the beans produced by the plant: after boiling them for a considerable time in water, and to a proper degree of softness, they

Dolce
||
Dolichos.

* See *Pha-
seolus*.

Dolichos

they beat or bray them into a softish pulse; incorporating with it, by means of repeated braying, a large quantity of common salt, four measures in summer, in winter three. The less salt that is added, the substance is more palatable; but what it gains in point of taste, it loses in durability. They then add to this mixture a certain preparation of rice, to which they give the name of *koos*; and having formed the whole into a compost, remove it into a wooden vessel which had lately contained their common ale or beverage named *sacki*. In about two months it is fit for use. The *koos* gives it a grateful taste; and the preparing of it, like the polenta of the Germans, requires the skilful hand of an experienced master. For this reason there are certain people who make it their sole business to prepare the *koos*, and who sell it ready made for the purpose of making miso: a substance which cannot fail to be greatly valued in those countries where butter from the milk of animals is unknown. To make *sooju* or *soy*, they take equal quantities of the same beans boiled to a certain degree of softness; of *muggi*, that is corn, whether barley or wheat, roughly ground; and of common salt. Having properly mixed the beans with the pounded corn, they cover up the mixture, and keep it for a day and a night in a warm place, in order to ferment; then putting the mass into a pot, they cover it with the salt, pouring over the whole two measures and a half of water. This compound substance they carefully stir at least once a-day, if twice or thrice the better, for two or three months: at the end of which time, they filtrate and express the mass, preserving the liquor in wooden vessels. The older it is, the better and the clearer; and if made of wheat instead of barley, greatly blacker. The first liquor being removed, they again pour water upon the remaining mass; which, after stirring for some days, as before, they express a second time, and thus obtain an inferior sort of *soy*.

3. The pruriens, or cow-itch, is also a native of warm climates. It hath a fibrous root, and an herbaceous climbing stalk, which is naked, dividing into a great number of branches; and rises to a great height when properly supported. The leaves are alternate and trilobate, rising from the stem and branches about 12 inches distant from each other. The footstalk is cylindrical, from 6 to 14 inches long. From the axilla of the leaf descends a pendulous solitary spike, from 6 to 14 inches long, covered with long blood-coloured papilionaceous flowers, rising by threes in a double alternate manner from small fleshy protuberances, each of which is a short pedunculus of three flowers. These are succeeded by leguminous, coriaceous pods, four or five inches long, crooked like an Italic *s*; densely covered with sharp hairs, which penetrate the skin, and cause great itching. This will grow in any soil in those countries where it is a native: but is generally eradicated from all cultivated grounds; because the hairs from the pods fly with the winds, and torment every animal they happen to touch. If it was not for this mischievous quality, the beauty of its flowers would intitle it to a place in the best gardens. It flowers in the cool months, from September to March, according to the situation.—The spiculæ, or sharp-hairs, of this plant, have been long used in South America in cases of worms; and have of late been frequently employed

in Britain. The spiculæ of one pod mixed with syrup or molasses, and taken in the morning fasting, is a dose for an adult. The worms are said to appear with the second or third dose; and by means of a purge in some cases the stools are said to have consisted almost entirely of worms; and in cases of lumbrici, it is said to produce a safe and effectual cure. Those who have used it most, particularly Dr Bancroft and Dr Cochrane, affirm that they have never seen any inconvenience resulting from the internal use of it, notwithstanding the great uneasiness it occasions on the slightest touch to any part of the surface.

DOLLAR, or DALLER, a silver coin, nearly of the value of the Spanish piece of eight or French crown.

Dollars are coined in different parts of Germany and Holland; and have their diminutions, as semi-dollars, quarter dollars, &c. See *MONEY-Table*.

They are not all of the same fineness nor weight. The Dutch dollars are the most frequent. In the Levant they are called *aslaini*, from the impression of a lion thereon.

DOLPHIN, in ichthyology. See DELPHINUS.

DOLPHIN of the Mast, a peculiar kind of wreath, formed of plaited cordage, to be fastened occasionally round the masts, as a support to the puddening, whose use is to sustain the weight of the fore and main yards in case the rigging or chains by which those yards are suspended should be shot away in the time of battle; a circumstance which might render their sails useless at a season when their assistance is extremely necessary. See the article PUDDENING.

DOM, or DON, a title of honour, invented and chiefly used by the Spaniards, signifying *sir* or *lord*.

This title, it seems, was first given to Pelayo, in the beginning of the eighth century. In Portugal no person can assume the title of *don* without the permission of the king, since it is looked upon as a mark of honour and nobility. In France it is sometimes used among the religious. It is an abridgment of *dominus*, from *dominus*.

Dom and Som, in old charters, signifies full property and jurisdiction.

DOMAIN, the inheritance, estate, or possession of any one. See DEMESNE.

DOMAT (John), a celebrated French lawyer born in 1625, who observing the confused state of the laws, digested them in 4 vols 4to, under the title of *The Civil Laws in their natural order*: for which undertaking, Louis XIV. settled on him a pension of 2000 livres. Domat was intimate with the famous Pascal, who left him his private papers at his death: he himself died in 1696.

DOVE, in architecture, a spherical roof, or a roof of a spherical form, raised over the middle of a building, as a church, hall, pavilion, vestibule, stair-case, &c. by way of crowning.

DOVE, in chemistry, the upper part of furnaces, particularly portable ones. It has the figure of a hollow hemisphere or small dome. Its use is to form a space in the upper part of the furnace, the air of which is continually expelled by the fire: hence the current of air is considerably increased, which is obliged to enter by the ash-hole, and to pass through the fire, to supply the place of the air driven from the dome. The form.

Dollar
||
Dome.

Dome form of this piece renders it proper to reflect or reverberate a part of the flame upon the matters which are in the furnace, which has occasioned this kind of furnace to be called a *reverberating* one. See FURNACE.

Dome **||** **Domesday** DOME, or *Doom*, signifies judgment, sentence, or decree. The homagers oath in the black book of Hereford ends thus: "So help me God at his holy *dome*, and by my trowthe."

DOMENICHINO, a famous Italian painter, born of a good family at Bologna in 1581. He was at first a disciple of Calvart the Fleming, but soon quitted his school for that of the Caraccis. He always applied himself to his work with much study and thoughtfulness; and never offered to touch his pencil but when he found a proper kind of enthusiasm upon him. His great skill in architecture also procured him the appointment of chief architect of the apostolical palace from Pope Gregory XV.; nor was he without a theoretical knowledge in music. He died in 1641.

DOMESDAY, or DOOMSDAY, BOOK, a most ancient record, made in the time of William I. surnamed the *Conqueror*, and containing a survey of all the lands of England. It consists of two volumes, a greater and a less. The first is a large folio, written on 382 double pages of vellum, in a small but plain character; each page having a double column. Some of the capital letters and principal passages are touched with red ink; and some have strokes of red ink run cross them, as if scratched out. This volume contains the description of 31 counties. The other volume is in quarto, written upon 450 double pages of vellum, but in a single column, and in a large but very fair character. It contains the counties of Essex, Norfolk, Suffolk, part of the county of Rutland included in that of Northampton, and part of Lancashire in the counties of York and Chester.

This work, according to the red book in the exchequer, was begun by order of William the Conqueror, with the advice of his parliament, in the year of our Lord 1080, and completed in the year 1086. The reason given for taking this survey, as assigned by several ancient records and historians, was, that every man should be satisfied with his own right, and not usurp with impunity what belonged to another. But, besides this, it is said by others, that now all those who possessed landed estates became vassals to the king, and paid him so much money by way of fee or homage in proportion to the lands they held. This appears very probable, as there was at that time extant a general survey of the whole kingdom, made by order of king Alfred.

For the execution of the survey recorded in domesday book, commissioners were sent into every county and shire; and juries summoned in each hundred, out of all orders of freemen, from barons down to the lowest farmers. These commissioners were to be informed by the inhabitants, upon oath, of the name of each manor, and that of its owner; also by whom it was held in the time of Edward the Confessor; the number of hides; the quantity of wood, of pasture, and of meadow-land; how many ploughs were in the demesne, and how many in the tenanted part of it; how many mills, how many fish-ponds or fisheries belonged to it; with the value of the whole together in the time of king Edward, as well as when granted by king Wil-

liam, and at the time of this survey; also whether it was capable of improvement, or of being advanced in its value: they were likewise directed to return the tenants of every degree, the quantity of lands then and formerly held by each of them, what was the number of villains or slaves, and also the number and kinds of their cattle and live stock. These inquiries being first methodized in the county, were afterwards sent up to the king's exchequer.

This survey, at the time it was made, gave great offence to the people; and occasioned a jealousy that it was intended for some new imposition. But notwithstanding all the precaution taken by the conqueror to have this survey faithfully and impartially executed, it appears from indisputable authority, that a false return was given in by some of the commissioners; and that, as it is said, out of a pious motive. This was particularly the case with the abbey of Croyland in Lincolnshire, the possessions of which were greatly underrated both with regard to quantity and value. Perhaps more of these pious frauds were discovered, as it is said Ralph Flambard, minister to William Rufus, proposed the making a fresh and more vigorous inquiry; but this was never executed.

Notwithstanding this proof of its falsehood in some instances, which must throw a suspicion on all others, the authority of domesday-book was never permitted to be called in question; and always, when it hath been necessary to distinguish whether lands were held in ancient demesne, or in any other manner, recourse was had to domesday-book, and to that only, to determine the doubt. From this definitive authority, from which, as from the sentence pronounced at *domesday*, or the day of judgment, there could be no appeal, the name of the book is said to have been derived. But Stowe assigns another reason for this appellation; namely, that domesday-book is a corruption of *domus Dei book*; a title given it because heretofore deposited in the king's treasury, in a place of the church of Westminster or Winchester, called *domus Dei*. From the great care formerly taken for the preservation of this survey, we may learn the estimation in which its importance was held. The dialogue de Scaccariis says, "*Liber ille (domesday) sigilli regis comes est individuus in thesauro.*" Until lately it has been kept under three different locks and keys; one in the custody of the treasurer, and the others in that of the two chamberlains of the exchequer. It is now deposited in the chapter-house at Westminster, where it may be consulted on paying to the proper officers a fee of 6s. 8d. for a search, and fourpence per line for a transcript.

Besides the two volumes above mentioned, there is also a third made by order of the same king; and which differs from the others in form more than matter. There is also a fourth called *domesday*, which is kept in the exchequer; which, though a very large volume, is only an abridgement of the others. In the remembrancer's office in the exchequer is kept a fifth book, likewise called *domesday*, which is the same with the fourth book already mentioned. King Alfred had a roll which he called *domesday*; and the domesday-book made by William the Conqueror referred to the time of Edward the Confessor, as that of king Alfred did to the time of Ethelred. The fourth book of domesday having many pictures and gilt letters in the beginning

Domestic. ning relating to the time of king Edward the Confessor, this had led some into a false opinion that domestic-day-book was composed in the reign of king Edward.

DOMESTIC, any man who acts under another, serving to compose his family; in which he lives, or is supposed to live, as a chaplain, secretary, &c. Sometimes domestic is applied to the wife and children; but very seldom to servants, such as footmen, lacquies, porters, &c.

DOMESTIC, *adj.* is sometimes opposed to foreign. Thus "*domestic occurrences*" signify those events which happen in our own country, in contradistinction to those of which we receive intelligence from abroad.

In its more usual acceptation, the term implies something peculiar to *home* or *household*. Thus we speak of *domestic happiness* or *pleasures*: meaning the pleasures enjoyed in the bosom of one's family; in opposition to those found in the bustle of public life, or delusively sought in the haunts of dissipation.

The solace of domestic enjoyments has been coveted by the wisest and greatest of men. Senators and heroes have shut out the acclamations of an applauding world, to enjoy the prattling of their little ones, and to partake the endearments of family conversation. They knew that even their best friends, in the common intercourse of life, were in some degree actuated by interested motives in displaying their affection; that many of their followers applauded them in hopes of reward; and that the giddy multitude, however zealous, were not always judicious in their approbation. But the attentions paid them at their fire-side, the smiles which exhilarated their own table, were the genuine result of undissembled love.

*Knox's
Essays,
No 40.*

To pursue the observations of an elegant essayist: "The nursery has often alleviated the fatigues of the bar and the senate-house. Nothing contributes more to raise the gently pleasing emotions, than the view of infant innocence, enjoying the raptures of a game at play. All the sentiments of uncontrolled nature display themselves to the view, and furnish matter for agreeable reflection to the mind of the philosophical observer. To partake with children in their little pleasures, is by no means unmanly. It is one of the purest sources of mirth. It has an influence in amending the heart, which necessarily takes a tincture from the company that surrounds us. Innocence as well as guilt is communicated and increased by the contagion of example. And the great Author of evangelical philosophy has taught us to emulate the simplicity of the infantine age. He seems indeed himself to have been delighted with young children, and found in them, what he in vain sought among those who judged themselves their superiors, unpolluted purity of heart.

"Among the great variety of pictures which the vivid imagination of Homer has displayed throughout the Iliad, there is not one more pleasing than the family-piece, which represents the parting interview between Hector and Andromache. It deeply interests the heart, while it delights the imagination. The hero ceases to be terrible, that he may become amiable. We admire him while he stands completely armed in the field of battle; but we love him more while he is taking off his helmet, that he may not frighten his little boy with its nodding plumes. We are refreshed with the tender scene of domestic love, while all

around breathes rage and discord. We are pleased to see the arm, which is shortly to deal death and destruction among a host of foes, employed in caressing an infant son with the embraces of paternal love. A professed critic would attribute the pleasing effect entirely to contrast; but the heart has declared, previously to the inquiries of criticism, that it is chiefly derived from the satisfaction which we naturally take in beholding great characters engaged in tender and amiable employments.

"But after all that is said of the purity and the solidity of domestic pleasures, they unfortunately appear, to a great part of mankind, insipid, unmanly, and capable of satisfying none but the weak, the spiritless, the inexperienced, and the effeminate. The pretenders to wit and modern philosophy are often found to renounce the received opinions of prudential conduct; and, while they affect a superior liberality, to regulate their lives by the most selfish principles. Whatever appears to have little tendency to promote personal pleasure and advantage, they leave to be performed by those simple individuals, who are dull enough, as they say, to pursue the journey of life by the straight road of common sense. It is true, they will allow, that the world must be replenished by a perpetual succession; and it is no less true, that an offspring, once introduced into the world, requires all the care of painful attention. But let the task be reserved for meaner spirits. If the passions can be gratified without the painful consequences of supporting a family, they eagerly seize the indulgence. But the toil of education they leave to those whom they deem fools enough to take a pleasure in it. There will always be a sufficient number, say they, whose folly will lead them, for the sake of a silly passion called virtuous love, to engage in a life of perpetual anxiety. The fool's paradise, they add with derision, will never be deserted.

"Presumptuous as are all such pretenders to newly-invented systems of life and conduct, it is not to be supposed they will think themselves superior to Cicero. Yet Cicero, with all his liberality of mind, felt the tenderness of conjugal and paternal attachment, and acknowledged that, at one time, he received no satisfaction in any company but that of his wife, his little daughter, and, to use his own epithet, his *honest* young Cicero. The great Sir Thomas More, whom nobody will suspect of narrowness of mind, who by a very singular treatise evinced that he was capable of thinking and of choosing for himself, has left it on record that he devoted a great share of his time, from the united motives of duty and delight, to the amusement of his children.

"It will be objected by those who pretend to have formed their ideas of life from actual observation, that domestic happiness, however pleasing in description, like many a poetic dream, is but an alluring picture, designed by a good heart, and painted in glowing colours by a lively fancy. The constant company, they urge, even of those we love, occasions an insipidity. Insipidity grows into disgust. Disgust, long continued, sours the temper. Peevishness is the natural consequence. The domestic circle becomes the scene of dispute. Mutual antipathy is ingenious in devising mutual torment. Sullen silence or malignant remarks fill up every hour, till the arrival of a stranger causes a temporary

Domestic porary restraint, and excites that good humour which ought to be displayed among those whom the bonds of affection and blood have already united.

Dominant.

“ Experience, indeed, proves that these remarks are sometimes verified. But that there is much domestic misery is no argument that there is no domestic happiness, or that the evil may not be removed. Natural stupidity, natural ill temper, acquired ill habits, want of education, illiberal manners, and a neglect of the common rules of discretion, will render every species of intercourse disagreeable. When those are united by connubial ties who were separated by natural and inherent diversity, no wonder if that degree of happiness which can only result from a proper union, is unknown. In the forced alliance, which the poet of *Venusium* mentions, of the serpent with the dove, of the tyger with the lamb, there can be no love. When we expatiate on the happiness of the domestic groupe, we presuppose that all who compose it are originally assimilated by affection, and are still kept in union by discreet friendship. Where this is not the case, the censure must fall on the discordant disposition of the parties, and not on the essential nature of family intercourse.

“ To form, under the direction of prudence, and by the impulse of virtuous love, an early conjugal attachment, is one of the best securities of virtue, as well as the most probable means of happiness. The duties, which are powerfully called forth by the relations of husband and father, are of that tender kind which inspires goodness and humanity. He who beholds a woman whom he loves, and an helpless infant, looking up to him for support, will not easily be induced to indulge in unbecoming extravagance, or devote himself to indolence. He who has a rising family to introduce into a vicious world, will be cautious of setting a bad example, the contagion of which, when it proceeds from parental authority, must be irresistibly malignant. Thus many who, in their individual and unconnected state, would probably have spent a life not only useless to others, but profligate and careless in itself, have become valuable members of the community, and have arrived at a degree of moral improvement, to which they would not otherwise have attained.

“ The contempt in which domestic pleasures have in modern times been held, is a mark of profligacy. It is also a proof of a prevailing ignorance of real enjoyment. It argues a defect in taste and judgment as well as in morals. For the general voice of the experienced has in all ages declared, that the truest happiness is to be found at home.”

DOMICILE, in Scots law, is the dwelling-place where a person lives with an intention to remain.

DOMIFYING, in astrology, the dividing or distributing the heavens into 12 houses, in order to erect a theme, or horoscope, by means of six great circles, called *circles of position*.

There are various ways of domifying: that of *Regiomontanus*, which is the most common, makes the circles of position pass through the intersections of the meridian and the horizon: others make them pass through the poles of the zodiac.

DOMINANT (from the Latin word *dominari* “to

rule or govern”), among musicians, is used either as an adjective or substantive; but these different acceptations are far from being indiscriminate. In both senses it is explained by Rousseau as follows.

The *dominant* or sensible chord is that which is practised upon the dominant of the tone, and which introduces a perfect cadence. Every perfect major chord becomes a *dominant* chord, as soon as the seventh minor is added to it.

Dominant (subst.). Of the three notes essential to the tone, it is that which is a fifth from the tonic. The tonic and the *dominant* fix the tone; in it they are each of them the fundamental sound of a particular chord; whereas the mediant, which constitutes the mode, has no chord peculiar to itself, and only makes a part of the chord of the tonic.

Mr Rameau gives the name of *dominant* in general to every note which carries a chord of the seventh, and distinguishes that which carries the sensible chord by the name of a *tonic dominant*; but, on account of the length of the word, this addition to the name has not been adopted by artists: they continue simply to call that note a *dominant* which is a fifth from the tonic; and they do not call the other notes which carry a chord of the seventh *dominants*, but *fundamentals*; which is sufficient to render their meaning plain, and prevents confusion.

A *dominant*, in that species of church-music which is called *plain-chant*, is that note which is most frequently repeated or beaten, in whatever degree it may be from the tonic. In this species of music there are *dominants* and *tonics*, but no mediant.

DOMINATION, or **DOMINION**, in theology, the fourth order of angels or blessed spirits in the hierarchy, reckoning from the seraphim. See **ANGEL**.

DOMINGO, or **St DOMINGO**, the capital of the island of Hispaniola in the West Indies, is seated in that part belonging to the Spaniards on the south side of the island, and has a commodious harbour. The town is built in the Spanish manner, with a great square in the middle of it; about which are the cathedral and other public buildings. From this square run the principal streets, in a direct line, they being crossed by others at right angles, so that the form of the town is almost square. The country on the north and east side is pleasant and fruitful; and there is a large navigable river on the west, with the ocean on the south. It is the see of an archbishop, an ancient royal audience, and the seat of the governor. It has several fine churches and monasteries; and is so well fortified, that a fleet and army sent by Oliver Cromwell in 1654 could not take it. The inhabitants are Spaniards, Negroes, Mulattoes, Mestices, and Albatraces; of whom about a sixth part may be Spaniards. It had formerly about 2000 houses, but it is much declined of late years. The river on which it is seated is called *Ozama*. W. Long. 69. 30. N. Lat. 18. 25.

DOMINIC (de Gusman), founder of the Dominican order of monks, was born at Calaroga in Old Castile, 1170. He preached with great fury against the Albigenses, when Pope Innocent III. made a crusade against that unhappy people; and was inquisitor in Languedoc, where he founded his order, and got it confirmed by the Lateran council in 1215. He died

at

Dominant
||
Dominic

Dominica at Bologna in 1221, and was afterwards canonized.
Dominical. The dominican order has produced many illustrious men. See DOMINICANS.

DOMINICA, one of the Caribbee islands in the West Indies, about 39 miles long and 13 broad, situated between 61° and 62° W. Long. and between 15° and 16° of N. Lat. This island formerly belonged to the French, but was ceded to Britain by the treaty in 1763. It is very advantageous to the latter, as being situated between the French islands of Gaudaloupe and Martinico, so that it is equally alarming to both; and its safe and commodious roads enable the British privateers to intercept, without risk, the navigation of France in her colonies, whenever a war happens between the two nations.

This island was reduced, in the year 1778, by the French, under the marquis de Bouille, governor of Martinico. At that time the island, though very well fortified, had been unaccountably neglected by the British government, in such a manner as to be almost entirely destitute of a garrison. The French commander therefore, who made a descent with 2000 men, found only 100 regular forces and a few companies of militia to oppose him. All resistance therefore being vain, the only thing the garrison could do was to procure as favourable terms of capitulation as possible. These were granted with such readiness as did great honour to the character of this officer; the inhabitants experiencing no kind of change except that of transferring their obedience from Britain to France, being left unmolested in the enjoyment of all their rights both civil and religious. The capitulation was strictly observed by the Marquis; no plunder or irregularity being allowed, and a pecuniary gratification being distributed among the soldiers and volunteers who accompanied him in the expedition. An hundred and sixty-four pieces of excellent cannon, and twenty-four brass mortars, besides a large quantity of military stores, were found in the place; insomuch that the French themselves expressed their surprise at finding so few hands to make use of them. The Marquis, however, took care to supply this defect, by leaving a garrison of 1500 of the best men he had with him. It was restored to Britain at the conclusion of the peace in 1783.

La DOMINICA, one of the MARQUESAS Islands in the South-Sea.

DOMINICAL LETTER, popularly called *Sunday-Letter*, one of the seven letters A B C D E F G, used in almanacks, ephemerides, &c. to denote the Sundays throughout the year. See CHRONOLOGY, n° 32. The word is formed from *dominica* or *dominus dies*, "Lord's-day, Sunday."

The dominical letters were introduced in the kalendar by the primitive Christians, in lieu of the NUNDINAL letters in the Roman kalendar.

DOMINICAL, in church-history. The council of Auxerre, held in 578, decrees, that women communicate with their dominical. Some authors contend, that this dominical was a linen cloth, wherein they received the species; as not being allowed to receive them in the bare hand. Others will have it a kind of veil, wherewith they covered the head. The most probable account is, that it was a sort of linen cloth or handkerchief wherein they received and preserved the eu-

charist in times of persecution, to be taken on occasion at home. This appears to have been the case by the practice of the first Christians, and by Tertullian's book *Ad Uxorem*.

DOMINICANS, an order of religious, called in some places *Jacobins*; and in others, *Predicants*, or *Preaching Friars*.

The Dominicans take their name from their founder Dominic de Guzman, a Spanish gentleman, born in 1170, at Calaroga in Old Castile. He was first canon and archdeacon of Osma; and afterwards preached with great zeal and vehemence against the Albigenses in Languedoc, where he laid the first foundation of his order. It was approved of in 1215 by Innocent III. and confirmed in 1216 by a bull of Honorius III. under the title of *St Augustin*; to which Dominic added several austere precepts and observances, obliging the brethren to take a vow of absolute poverty, and to abandon entirely all their revenues and possessions; and also the title of *Preaching Friars*, because public instruction was the main end of their institution.

The first convent was founded at Tholouse by the bishop thereof and Simon de Montfort. Two years afterwards they had another at Paris, near the bishop's house; and some time after a third in the rue St Jacques, St James's street, whence the denomination of *Jacobins*.

Just before his death, Dominic sent Gilbert de Fresney, with twelve of the brethren, into England, where they founded their first monastery at Oxford in the year 1221, and soon after another at London. In the year 1276, the mayor and aldermen of the city of London gave them two whole streets by the river Thames, where they erected a very commodious convent, whence that place is still called *Black Friars*, from the name by which the Dominicans were called in England.

St Dominic, at first, only took the habit of the regular canons; that is, a black cassock and rochet: but this he quitted in 1219, for that which they now wear, which it is pretended was shown by the blessed Virgin herself to the beatified Renaud d'Orleans.

This order is diffused throughout the whole known world. It has forty-five provinces under the general, who resides at Rome; and twelve particular congregations or reforms, governed by vicars general.

They reckon three popes of this order, above sixty cardinals, several patriarchs, a hundred and fifty archbishops, and about eight hundred bishops; beside masters of the sacred palace, whose office has been constantly discharged by a religious of this order, ever since St Dominic, who held it under Honorius III. in 1218.

Of all the monastic orders, none enjoyed a higher degree of power and authority than the Dominican friars, whose credit was great, and their influence universal. But the measures they used in order to maintain and extend their authority were so perfidious and cruel, that their influence began to decline towards the beginning of the sixteenth century. The tragic story of Jetzer, conducted at Bern in 1509, for determining an uninteresting dispute between them and the Franciscans, relating to the *immaculate conception*, will reflect indelible infamy on this order. See an account of it in Burnet's Travels through France, Italy, Germany, and

Dominion and Switzerland, p. 31. or Mosheim's Eccl. Hist. vol. iii. p. 294, 8vo. They were indeed perpetually employed in stigmatizing with the opprobrious name of heresy numbers of learned and pious men; in encroaching upon the rights and properties of others, to augment their possessions; and in laying the most iniquitous snares and stratagems for the destruction of their adversaries. They were the principal counsellors, by whose instigation and advice Leo X. was determined to the public condemnation of Luther. The papal see never had more active and useful abettors than this order, and that of the Jesuits.

The dogmata of the Dominicans are usually opposite to those of the Franciscans.

There are also nuns or sisters of this order, called in some places *Preaching Sisters*. These are even more ancient than the friars; St Dominic having founded a society of religious maids at Prouilles some years before the institution of his order of men; viz. in 1206.

There is also a third order of Dominicans, both for men and women.

DOMINION, **DOMINIUM**, in the civil law, signifies the power to use or dispose of a thing as we please.

DOMINION, or *Domination*. See **DOMINATION**.

DOMINIS (Mark Anthony de), archbishop of Spalatro in Dalmatia at the close of the 15th and beginning of the 16th centuries, was a man whose fickleness in religion proved his ruin. His preferment, instead of attaching him to the church of Rome, rendered him disaffected to it. Becoming acquainted with our bishop Bedell, while chaplain to Sir Henry Wotton ambassador from James I. at Venice, he communicated his books *De Republica Ecclesiastica* to him; which were afterwards published at London, with Bedell's corrections. He came to England with Bedell; where he was received with great respect, and preached and wrote against the Romish religion. He is said to have had a principal hand in publishing father Paul's *History of the Council of Trent*, at London, which was inscribed to James in 1619. But on the promotion of Pope Gregory XIV. who had been his school-fellow and old acquaintance, he was deluded by Gondomar the Spanish ambassador into the hopes of procuring a cardinal's hat, by which he fancied he should prove an instrument of great reformation in the church. Accordingly he returned to Rome in 1622, recanted his errors, and was at first well received: but he afterwards wrote letters to England, repenting his recantation; which being intercepted, he was imprisoned by Pope Urban VIII. and died in 1625. He was also the author of the first philosophical explanation of the rainbow, which before his time was accounted a prodigy.

DOMINIUM EMINENS, in Scots law, that power which the state or sovereign has over private property, by which the proprietor may be compelled to sell it for an adequate price where public utility requires. See **LAW**, N° clxii. 1.

DOMINIUM Directum, in Scots law, the right which a superior retains in his lands, notwithstanding the feudal grant to his vassal. See **LAW**, N° clxvi. 1.

DOMINIUM Utile, in Scots law, the right which the

vassal acquires in the lands by the feudal grant from his superior. See **LAW**, N° clxvi. 1.

DOMINUS, in ancient times, a title prefixed to a name, usually to denote the person either a knight or a clergyman. See *VICE-Dominus*.

The title was sometimes also given to a gentleman not dubbed; especially if he were lord of a manor. See **DOM**, **GENTLEMAN**, and **SIRE**.

In Holland, the title *dominus* is still retained, to distinguish a minister of the reformed church.

DOMITIAN, the Roman emperor, son to Vespasian, was the last of the 12 Cæsars. See (*History of*) **ROME**.

DON, or **TANAIS**, a river of Russia, which takes its rise from the small lake of St John, near Tula, in the government of Moscow, and passing through part of the province of Voronetz, a small portion of the Ukraina-Slobodskaja, and the whole province of Azof, divides itself near Tcherkask into three streams, and falls in these separate branches into the Sea of Azof. The river has so many windings, is in many parts so shallow, and abounds with such numerous shoals, as to be scarcely navigable, excepting in the spring, upon the melting of the snows; and its mouth is also so choaked up with sand, that only flat-bottomed vessels, excepting in the same season, can pass into the sea of Azof. The banks of the Don, and the rivulets which fall into it, are clothed with large tracts of forest, whose timber is floated down the stream to St Demetri and Rostof, where the frigates for the sea of Azof are chiefly constructed. The navigation of the Don, Mr Cox observes, may possibly hereafter be rendered highly valuable, by conveying to the Black Sea the iron of Siberia, the Chinese goods, and the Persian merchandize: which latter commodities, as well as the products of India, formerly found their way into Europe through this same channel.

DON is also the name of a river in Scotland, noticed under the article **ABERDEEN**; the Old Town being situated at its mouth. See **ABERDEEN**.

DONARIA, among the ancients, in its primary signification, was taken for the places where the oblations offered to the gods were kept; but afterwards was used to denote the offerings themselves; and sometimes, though improperly, the temples.

DONATIA, in botany: A genus of the trigynia order, belonging to the triandria class of plants. The calyx is a triphyllous perianthium, with short subulated leaves standing at a distance from one another. The corolla has from eight to ten petals of an oblong linear shape, twice as long as the calyx. The stamina are three subulated filaments the length of the calyx; the antheræ roundish, didymous, and two-lobed at the base.

DONATION, **DONATIO**, an act or contract whereby a man transfers to another either the property or the use of the whole or a part of his effects as a free gift.

A donation, to be valid and complete, supposes a capacity both in the donor and the donee; and requires consent, acceptance, and delivery; and by the French law registry also.

DONATION Mortis Causa, in law, a disposition of property made by a person in his last sickness, who apprehending

Dominus
||
Donation.

Donatists: hending his dissolution near, delivers, or causes to be delivered to another, the possession of any personal goods, to keep in case of his decease. If the donor dies, this gift needs not the consent of his executor; but it shall not prevail against creditors; and it is accompanied with this implied trust, that, if the donor lives, the property shall revert to himself, being only given in prospect of death, or *mortis causa*. This method of donation seems to have been conveyed to us from the civil lawyers, who borrowed it from the Greeks.

DONATISTS, ancient schismatics in Africa, so denominated from their leader Donatus.

They had their origin in the year 311, when, in the room of Mensurius, who died in that year on his return to Rome, Cæcilian was elected bishop of Carthage, and consecrated without the concurrence of the Numidian bishops, by those of Africa alone; whom the people refused to acknowledge, and to whom they opposed Majorinus; who, accordingly, was ordained by Donatus bishop of Casæ Nigræ. They were condemned, in a council held at Rome, two years after their separation; and afterwards in another at Arles, the year following; and again at Milan, before Constantine the Great, in 316, who deprived them of their churches, and sent their seditious bishops into banishment, and punished some of them with death. Their cause was espoused by another Donatus, called the *great*, the principal bishop of that sect, who, with numbers of his followers, was exiled by order of Constantine. Many of them were punished with great severity. See CIRCUMCELLIONES. However, after the accession of Julian to the throne in 362, they were permitted to return, and restored to their former liberty. Gratian published several edicts against them; and in 377 deprived them of their churches, and prohibited all their assemblies. But notwithstanding the severities they suffered, it appears that they had a very considerable number of churches towards the close of this century; but at this time they began to decline, on account of a schism among themselves, occasioned by the election of two bishops, in the room of Parmenian, the successor of Donatus; one party elected Primian, and were called *Primianists*, and another Maximian, and were called *Maximianists*. Their decline was also precipitated by the zealous opposition of St Augustin, and by the violent measures which were pursued against them, by order of the emperor Honorius, at the solicitation of two councils held at Carthage; the one in 404, and the other in 411. Many of them were fined, their bishops were banished, and some put to death. This sect revived and multiplied under the protection of the Vandals, who invaded Africa in 427, and took possession of this province; but it sunk again under new severities, when their empire was overturned in 534. Nevertheless, they remained in a separate body till the close of this century, when Gregory, the Roman pontiff, used various methods for suppressing them; his zeal succeeded, and there are few traces to be found of the Donatists after this period. They were distinguished by other appellations; as *Circumcelliones*, *Montenses*, or *Mountaineers*, *Campites*, *Rupites*, &c. They held three councils, or conciliabules; that of Cirta in Numidia, and two at Carthage.

Nº 103.

The errors of the Donatists, beside their schism, were, Donative. 1. That baptism conferred out of the church, that is, out of their sect, was null; and accordingly they rebaptized those who joined their party from other churches, and re-ordained their ministers. 2. That theirs was the only true, pure, and holy church; all the rest of the churches they held as prostitute and fallen.

Donatus seems likewise to have given into the doctrine of the Arians, with whom he was closely allied; and, accordingly, St Epiphanius, Theodoret, and some others, accused the Donatists of Arianism; and it is probable that the charge was well founded, because they were patronized by the Vandals, who were of these sentiments. But St Augustine, ep. 185, to count Boniface, & Hær. 69. affirms, that the Donatists, in this point, kept clear of the errors of their leader.

DONATIVE, DONATIVUM, a present made by any person; called also *gratuity*.

The Romans made large donatives to their soldiers. Julia Pia, wife of the emperor Severus, is called on certain medals *mater castrorum*, because of the care she took of the soldiery, by interposing for the augmentation of their donatives, &c.

Donative was properly a gift made to the soldiery; as *congiarium* was that made to the people. Salmasius, on his notes to Lampridius, in his Life of Heliogabalus, mentioning a donative that emperor gave of three pieces of gold *per* head, observes, that this was the common and legitimate rate of a donative. Casaubon, in his notes on the Life of Pertinax by Capitolinus, observes, that Pertinax made a promise of 3000 denarii to each soldier; which amounts to upwards of 97 pounds sterling. The same author writes, that the legal donative was 20,000 denarii; and that it was not customary to give less, especially to the prætorian soldiers; that the centurions had double, and the tribunes, &c. more in proportion.

DONATIVE, in the canon law, a benefice given, and collated to a person, by the founder or patron; without either presentation, institution, or induction by the ordinary.

If chapels founded by laymen be not approved by the diocesan, and, as it is called, *spiritualized*, they are not accounted proper benefices, neither can they be conferred by the bishop, but remain to the pious disposition of the founders; so that the founders, and their heirs, may give such chapels without the bishop.

Gwin observes, that the king might of ancient time found a free chapel, and exempt it from the jurisdiction of the diocesan; so may he, by letters patent, give liberty to a common person to found such a chapel, and make it donative, not presentable; and the chaplain, or beneficiary, shall be deprivable by the founder or his heir, and not by the bishop. And this seems to be the original of donatives in England.

Donatives are within the statute against simony; and if they have cure of souls, within that against pluralities. If the patron of a donative doth not nominate a clerk, there can be no lapse thereof, unless it be specially provided for in the foundation; but the bishop may compel him to do it by spiritual censures. But if it be augmented by queen Anne's bounty, it will lapse like other presentative livings. 1 Geo. 1. stat.

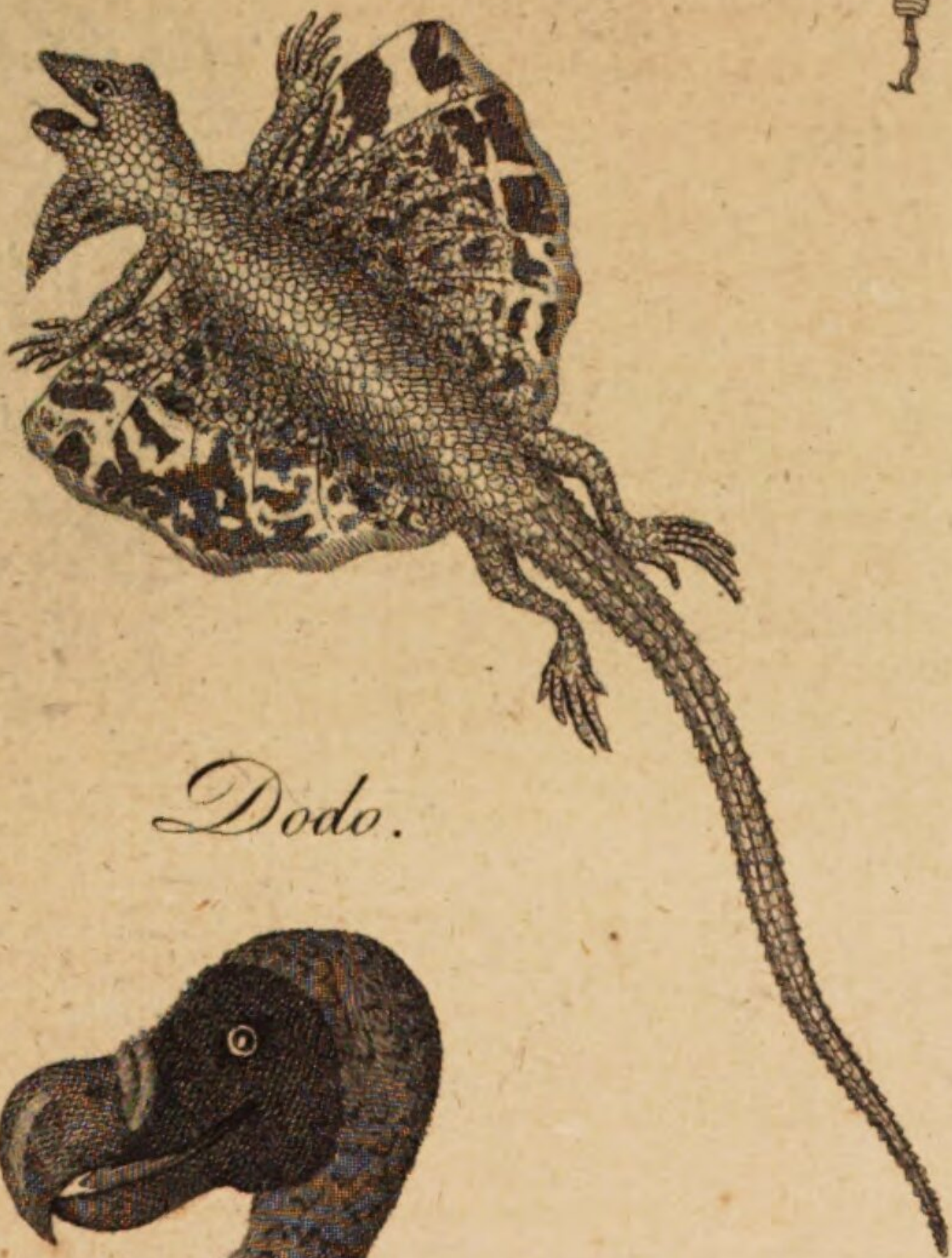
Dermestes



Dytiscus



Draco volans



Donax



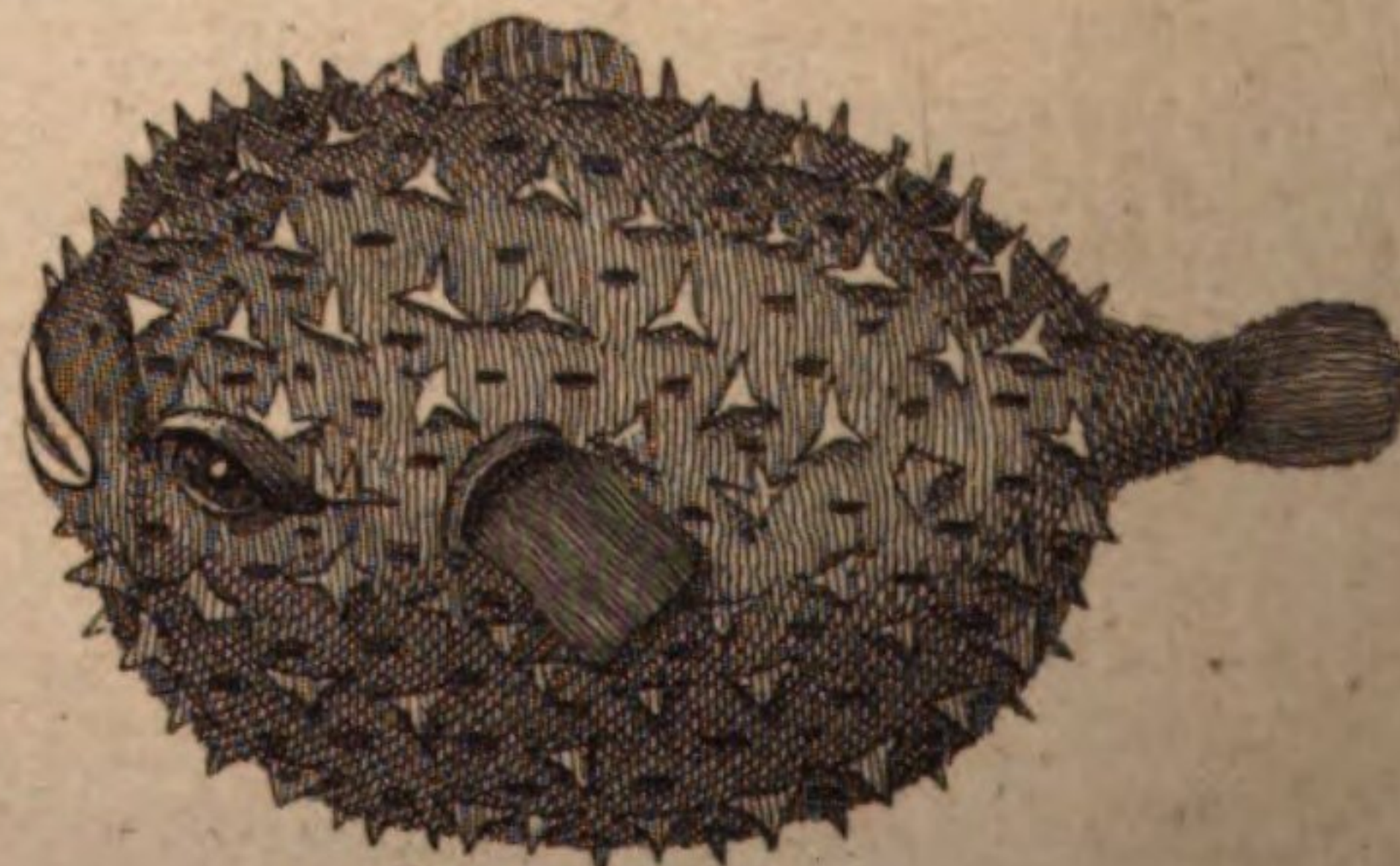
Doris



Dodo



Diodon



Donatory 2. cap. 10. The ordinary cannot visit a donative, and therefore it is free from procuration, and the incumbent is exempted from attendance at visitations.

||
Donne.

All bishopricks in ancient time were donative by the king. Again, where a bishop has the gift of a benefice, it is properly called a *donative*, because he cannot present to himself.

DONATORY, in Scots law, that person to whom the king bestows his right to any forfeiture that has fallen to the crown.

DONATUS, a schismatic bishop of Carthage, founder of the sect of **DONATISTS**. His followers swore by him, and honoured him like a god. He died about 368.

DONATUS (*Ælius*), a famous grammarian, lived at Rome in 354. He was one of St Jerome's masters; and composed commentaries on Terence and Virgil, which are esteemed.

DONAWERT, a strong town of Germany, in the circle of Bavaria on the frontiers of Suabia. It has been taken and retaken several times in the wars of Germany; and was formerly an imperial city, but at present is subject to the duke of Bavaria. E. Long. 10. 32. N. Lat. 48. 32.

DONAX, a genus of insects belonging to the order of vermes testacea. It is an animal of the oyster kind; and the shell has two valves, with a very obtuse margin in the fore-part. There are 10 species, principally distinguished by the figure of their shells.*

* Plate
CLXIV.

DONCASTER, a market-town of Yorkshire, 30 miles south of York. It was noted for knitting worsted stockings; that article of their trade is now on the decline.—Doncaster gives the English title of Earl to the duke of Buccleugh in Scotland, which belonged to his ancestor the duke of Monmouth, but was omitted out of the forfeiture. W. Long. 1. 0. N. Lat. 53. 30.

DONNE (Dr John), an excellent poet and divine of the 17th century. His parents were of the Romish religion, and used their utmost efforts to keep him firm to it; but his early examination of the controversy between the church of Rome and the Protestants, at last determined him to choose the latter. He travelled into Italy and Spain; where he made many useful observations, and learned their languages to perfection. Soon after his return to England, Sir Thomas Egerton, keeper of the great seal, appointed him his secretary; in which post he continued five years. He marrying privately Anne the daughter of Sir George Moore then chancellor of the garter, and niece to the lord keeper's lady, was dismissed from his place, and thrown into prison. But he was reconciled to Sir George by the good offices of Sir Francis Wolley. In 1612, he accompanied Sir Robert Drury to Paris. During this time, many of the nobility solicited the king for some secular employment for him. But his majesty, who took pleasure in his conversation, had engaged him in writing his *Pseudo Martyr*, printed at London in 1610; and was so highly pleased with that work, that in 1614 he prevailed with him to enter into holy orders; appointed him one of his chaplains, and procured him the degree of Doctor of Divinity from the university of Oxford. In 1619, he attended the earl of Doncaster in his embassy into Germany. In 1621, he was made dean of St Paul's.

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and the vicarage of St Dunstan in the west, in London, soon after fell to him; the advowson of it having been given to him long before by Richard earl of Dorset. By these and other preferments, he was enabled to be charitable to the poor, kind to his friends, and to make good provision for his children. He wrote, besides the above, 1. Devotions upon emergent occasions. 2. The Ancient History of the Septuagint, translated from the Greek of Aristeus, quarto. 3. Three volumes of sermons, folio. 4. A considerable number of poems; and other works. He died in 1631; and was interred in St Paul's cathedral, where a monument was erected to his memory. His writings show him to be a man of incomparable wit and learning; but his greatest excellence was satire. He had a prodigious richness of fancy, but his thoughts were much debased by his versification. He was, however, highly celebrated by all the great men of that age.

DONOR, in law, the person who gives lands or tenements to another in tail, &c.; as he to whom such lands, &c. are given, is the *donee*.

DOOMSDAY BOOK. See *DOMESDAY Book*.

DOOR, in architecture. See *ARCHITECTURE*, n^o 76.

DOR, the English name of the common black beetle. Some apply it also to the dusty beetle, that flies about hedges in the evening. See *SCARABÆUS*.

DORADO, in astronomy, a southern constellation, not visible in our latitude; it is also called *xiphias*. The stars of this constellation, in Sharp's Catalogue, are six.

DORCHESTER, the capital of Dorsetshire, situated on the river Frome, six miles north of Weymouth: W. Long. 2. 35. N. Lat. 50. 40. It gives the title of marquis to the noble family of Pierpoint, duke of Kingston; and sends two members to parliament.

DOREE, or **JOHN DOREE**, in ichthyology. See *ZEUS*.

DORIA (Andrew), a gallant Genoese sea-officer, born in 1466. He entered into the service of Francis I. of France; but preserved that spirit of independence so natural to a sailor and a republican. When the French attempted to render Savona, long the object of jealousy to Genoa, its rival in trade, Doria remonstrated against the measure in a high tone; which bold action, represented by the malice of his courtiers in the most odious light, irritated Francis to that degree, that he ordered his admiral Barbesieux to sail to Genoa, then in the hands of the French troops, to arrest Doria, and to seize his galleys. This rash order Doria got timely hints of; retired with all his galleys to a place of safety; and, while his resentment was thus raised, he closed with the offers of the emperor Charles V. returned his commission with the collar of St Michael to Francis, and hoisted the Imperial colours. To deliver his country, weary alike of the French and Imperial yoke, from the dominion of foreigners, was now Doria's highest ambition; and the favourable moment offered. Genoa was afflicted with the pestilence, the French garrison was greatly reduced and ill-paid, and the inhabitants were sufficiently disposed to second his views. He sailed to the harbour with 13 galleys, landed 500 men, and made himself master of the gates and the palace with very little resistance. The French governor with his feeble garrison retired to the citadel,

Doner
||
Doria.

M

but

Doric.

but was quickly forced to capitulate; when the people ran together, and levelled the citadel with the ground. It was now in Doria's power to have rendered himself the sovereign of his country; but, with a magnanimity of which there are few examples, he assembled the people in the court before the palace, disclaimed all pre-eminence, and recommended to them to settle that form of government they chose to establish. The people, animated by his spirit, forgot their factions, and fixed that form of government which has subsisted ever since with little variation. This event happened in 1528. Doria lived to a great age, respected and beloved as a private citizen; and is still celebrated in Genoa by the most honourable of all appellations, "The father of his country, and the restorer of its liberty."

DORIC, in general, any thing belonging to the Dorians, an ancient people of Greece, inhabiting near mount Parnassus. See DORIS.

DORIC, in architecture, is the second of the five orders; being that between the Tuscan and Ionic. It is usually placed upon the Attic base, though originally it had no base. See ARCHITECTURE, n° 43.

At its first invention it was more simple than at present; and when in after-times they came to adorn and enrich it more, the appellation *Doric* was restrained to this richer manner, and the primitive simple manner they called by a new name, the Tuscan order, which was chiefly used in temples; as the former, being more light and delicate, was for porticos and theatres. The tradition is, that Dorus, king of Achaia, having first built a temple of this order at Argos, which he dedicated to Juno, occasioned it to be called *Doric*; though others derive its name, from its being invented or used by the Dorians.

The moderns, on account of its solidity, use it in large strong buildings; as in the gates of cities and citadels, the outides of churches, and other massy works, where delicacy of ornaments would be unsuitable. The gate of Burlington-house in Piccadilly is of the Doric order.

The most considerable antient monuments of this order, are the theatre of Marcellus at Rome; wherein the capital, the height of the frize, and its projecture, are much smaller than in the modern architecture; and the Parthenion, or temple of Minerva at Athens, in which the short and massy columns bear upon the pavement without a base; and the capital is a simple torus, with its cincture, and a square, plain, and solid abacus.

DORIC Cymatium. See CYMA.

DORIC Dialect, one of the five dialects, or manners of speaking, which obtained among the Greeks.

It was first used by the Lacedemonians, and particularly those of Argos; thence it passed into Epirus, Libya, Sicily, the islands of Rhodes, and Crete. In this dialect, Archimedes and Theocritus wrote, who were both of Syracuse; as likewise Pindar.

In strictness, however, we should rather define Doric, the manner of speaking peculiar to the Dorians, after their recess near Parnassus and Alosus; and which afterwards came to obtain among the Lacedemonian, &c. Some even distinguish between the Lacedemonian and Doric; but, in reality, they were the same; setting aside a few particularities in the

language of the Lacedemonians; as is shown by Rulandus, in his excellent treatise *De Lingua Græca ejusque Dialectis*, lib. v.

Beside the authors already mentioned to have written in the Doric dialect, we might add Archytas of Tarentum, Bion, Callinus, Simonides, Bacchylides, Cypselas, Alcman, and Sophron.

Most of the medals of the cities of Græcia Magna, and Sicily, favour of the Doric dialect in their inscription: witness, ΑΜΒΡΑΚΙΩΤΑΝ, ΑΠΟΛΛΩΝΙΑΤΑΝ, ΑΧΕΡΟΝΤΑΝ, ΑΧΤΡΙΑΝ, ΗΡΑΚΛΕΩΤΑΝ, ΤΡΑΧΙΝΙΩΝ, ΟΕΡΜΙΑΝ, ΚΑΤΑΟΝΙΑΤΑΝ, ΚΟΡΙΑΤΑΝ, ΤΑΤΡΟΜΕΝΙΑΝ, &c. Which shows the countries wherein the Doric dialect was used.

The general rules of this dialect are thus given by the Port-royalists.

D' Ητα, d' a grand, d' e, do & d' u l' a fait le Dore.

D' u fait ητα; d' u, ω; & d' u au fait encore.

Offe : de l' infini : & pour le singulier

Se sert au féminin du nombre pluriel.

But they are much better explained in the fourth book of Rulandus; where he even notes the minuter differences of the dialects of Sicily, Crete, Tarentum, Rhodes, Lacedæmon, Laconia, Macedonia, and Thessaly.

The *a* abounds every where in the Doric; but this dialect bears so near a conformity with the Æolic, that many reckon them but one.

DORIC Mode, in music, the first of the authentic modes of the ancients. Its character is to be severe, tempered with gravity and joy; and is proper upon religious occasions, as also to be used in war. It begins *D, la, sol, re*. Plato admires the music of the Doric mode, and judges it proper to preserve good manners as being masculine; and on this account allows it in his commonwealth. The ancients had likewise their subdoric or hypodoric mode, which was one of the plagal modes. Its character was to be very grave and solemn: it began with *re*, a fourth lower than the doric.

DORING, or DARING, among sportsmen, a term used to express a method of taking larks, by means of a clap-net and a looking-glass. For this sport there must be provided four sticks very straight and light, about the bigness of a pike; two of these are to be four feet nine inches long, and all notched at the edges or the ends. At one end of each of these sticks there is to be fastened another of about a foot long on one side; and on the other side a small wooden peg about three inches long. Then four or more sticks are to be prepared, each of one foot length; and each of these must have a cord of nine feet long fastened to it at the end. Every one should have a buckle for the commodious fastening on to the respective sticks when the net is to be spread.—A cord must also be provided, which must have two branches. The one must have nine feet and a half, and the other ten feet long, with a buckle at the end of each; the rest, or body of the cord, must be 24 yards long. All these cords, as well the long ones as those about the sticks, must be well twitted and of the bigness of one's little finger. The next thing to be provided is a staff of four feet long, pointed at one end, and with a ball of wood at the other, for the carrying these conveniences in a sack or wallet.—There should also be carried, on this occasion, a spade

Doric,
Doring.

Doring,
Doris.

to level the ground where there may be any little irregularities; and two small rods, each 18 inches long, and having a small rod fixed with a pack-thread at the larger end of the other. To these are to be tied some pack-thread loops, which are to fasten in the legs of some larks; and there are to be reels to these, that the birds may fly a little way up and down. When all this is done, the looking-glass is to be prepared in the following manner. Take a piece of wood about an inch and an half thick, and cut it in form of a bow, so that there may be about nine inches space between the two ends; and let it have its full thickness at the bottom, that it may receive into it a false piece; in the five corners of which there are to be set in five pieces of looking-glass. These are so fixed, that they may dart their light upwards; and the whole machine is to be supported on a moveable pin, with the end of a long line fixed to it, and made in the manner of the children's play-thing of an apple and a plum-stone; so that the other end of the cord being carried through a hedge, the barely pulling it may set the whole machine of the glasses a-turning. This and the other contrivances are to be placed in the middle between the two nets. The larks fixed to the place, and termed *calls*, and the glittering of the looking-glasses as they twirl round in the sun, invite the other larks down; and the cord that communicates with the nets, and goes through the hedge, gives the person behind an opportunity of pulling up the nets, so as to meet over the whole, and take every thing that is between them. The places where this sort of sporting succeeds best are open fields remote from any trees and hedges except one by way of shelter for the sportsman: and the wind should always be either in the front or back; for if it blows sideways, it prevents the playing of the net.

DORIS, a country of Greece, between Phocis, Thessaly, and Acarnania. It received its name from Dorus the son of Deucalion, who made a settlement there. It was called *Tetrapolis* from the four cities of Pindus or Dryopis, Erineum, Cytinium, Borium, which it contained. To these four some add Lilæum and Carphia, and therefore call it *Hexapolis*. The name of Doris has been common to many parts of Greece. The Dorians in the age of Deucalion inhabited Phthiotis, which they exchanged for Histiaeotis, in the age of Dorus. From thence they were driven by the Cadmeans, and came to settle near the town of Pindus. From thence they passed into Dryopis, and afterwards into Peloponnesus. Hercules having re-established Ægimius king of Phthiotis or Doris, who had been driven from his country by the Lapithæ, the grateful king appointed Hyllus the son of his patron to be his successor, and the Heraclidæ marched from that part of the country to go to recover Peloponnesus. The Dorians sent many colonies into different places, which bore the same name as their native country. The most famous of these is in Asia Minor, of which Halicarnassus was once the capital. This part of Asia Minor was called *Hexapolis*, and afterwards *Pentapolis*.

DORIS, a genus of insects, belonging to the order of vermes testacea. The body is oblong, flat beneath; creeping: mouth placed below: vent behind surrounded with a fringe: two feelers, retractile. There are

several species.—The argo, or lemon doris, has an oval body, convex, marked with numerous punctures, of a lemon colour, the vent beset with elegant ramifications. It inhabits different parts of our seas, called about Brighthelmstone the *sea-lemon*. See Plate CLXIV.

DORMANT, in heraldry, is used for the posture of a lion, or any other beast, lying along in a sleeping attitude with the head on the fore-paws; by which it is distinguished from the *couchant*, where though the beast is lying, yet he holds up his head.

DORMER, in architecture, signifies a window made in the roof of an house, or above the entablature, being raised upon the rafters.

DORMITORY, a gallery in convents or religious houses, divided into several cells, in which the religious sleep or lodge.

DORMOUSE, in zoology. See Mus and Sciurus.

DORONICUM, LEOPARD'S BANE: A genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Composite*. The receptacle is naked, the pappus simple; the scales of the calyx in a double row, longer than the disc. The seeds of the radius naked without any pappus. There are three species; of which the only one worthy of notice is the pardalianches, with obtuse heart-shaped leaves. It grows naturally in Hungary, and on the Helvetian mountains; but is frequently preserved in the English gardens. It hath thick fleshy roots, which divide into many knobs or knees, sending out strong fleshy fibres which penetrate deep into the ground; from these arise in the spring a cluster of heart-shaped leaves, which are hairy, and stand upon footstalks: between these arise the flower-stalks, which are channelled and hairy, near three feet high, putting out one or two smaller stalks from the side. Each stalk is terminated by one large yellow flower. The plant multiplies very fast by its spreading roots; and the seeds, if permitted to scatter, will produce plants wherever they happen to fall; so that it very soon becomes a weed in the places where it is once established. It loves a moist soil and shady situation. The roots were formerly used in medicine as alexipharmics and purifiers of the blood, but their operation was so violent that they are now entirely laid aside.

DORSAL, an appellation given to whatever belongs to the back. See DORSUM.

DORSET (Thomas Sackville), Lord Buckhurst. See SACKVILLE.

DORSET (Charles Sackville), Earl of. See SACKVILLE.

DORSETSHIRE, a county of England, bounded on the south by the English channel, on the north by Somersetshire and Wiltshire, on the east by Hampshire, and on the west by Devonshire and some part of Somersetshire. It is between 40 and 50 miles long from east to west, and 34 broad from south to north, and contains 34 hundreds, 22 market-towns, and 248 parishes. This county enjoys a mild, pleasant, and wholesome air, and a deep, rich, and fertile soil, finely diversified. Towards the north it is level, under the high lands that divide it from Somersetshire, where there are fine arable grounds that will yield large crops of different kinds of grain. But on the south, from

Dormant
||
Dorset-
shire.

Dorsiferous the borders of Hampshire by the sea-coast, for an extent of almost 20 miles in length, and in some places four or five in breadth, is an heathy common, which renders this country less populous than it otherwise would be. From east to west run a ridge of hills called the *Downs*, abounding with sweet and short herbage, which nourishes a vast number of sheep equally esteemed for their flesh and fleece. The country is also very plentifully watered; and in all respects so well suited both for pleasure and profit, that it was distinguished by the Romans above all others. They had more stations and summer-camps in Dorsetshire than in any other county. That the Saxons had the same regard for it, is evident from the number of palaces they had in it, the stately minsters they built, and the express directions they gave that their bodies should be interred in those monuments of their piety. This country yields many and very valuable commodities. The quarries in Purbeck and Portland supply stones of different qualities, suited to various uses, and in prodigious quantities, together with some very rich and beautiful marble. The best tobacco-pipe clay in England is also found in this county. Madder, hemp, and flax, also thrive in many places, grain of all sorts, &c.

DORSIFEROUS PLANTS, among botanists, such as are of the capillary kind, without stalks, and which bear their seeds on the back-side of their leaves.

DORSTENIA, **CONTRAYERVA**: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 53d order, *Scabridae*. The receptacle is common, monophyllous, and carnosus; the seeds lying singly in the carnosus substance. There are four species, all of them low herbaceous plants, growing in the warm countries of America. The root is used in medicine. It is full of knots; an inch or two in length, about half an inch thick; externally of a reddish brown colour, and pale within; long, tough, slender fibres shoot out from all sides of it, which are generally loaded with small round knots. The root has a peculiar kind of aromatic smell, and a somewhat astringent, warm, bitterish taste, with a light and sweetish kind of acrimony when chewed. The fibres have little taste or smell; the tuberous part therefore should only be chosen.—*Contrayerva* is one of the mildest of those substances called *alexipharmics*: it is indisputably a good and useful diaphoretic. Its virtues are extracted both by water and rectified spirit, and do not arise by evaporation with either. The plants cannot be propagated in this country without the greatest difficulty.

DORSUM, the **BACK**, in anatomy, comprehends all the posterior part of the trunk of the body from the neck to the buttocks. See **ANATOMY**, n° 29, &c.

DORT, or **DORDRECHT**, a city of Holland, which holds the first rank in the assembly of the states. It is seated in a small island formed by the rivers Meuse, Merue, Rhine, and Linghe. The Meuse, on which it stands, gives it a good harbour, and separates it from the islands of Iffelmonde and Ablas. It is divided from Beyerland by a canal. The harbour is very commodious for the merchandizes which come down the Rhine and the Meuse, which keep it in a flourishing condition. Its strength consists in being surrounded with water. Its walls are old, and defended by round towers. It is very rich, and well built with brick, and

had formerly the exclusive right of coining money. It is at present the staple town for wines, particularly Rhenish. It was detached from the main land in 1421, on the 17th of November, by a flood occasioned by the breaking down of the dyke, which overwhelmed 70 villages, and about 100,000 persons. However, by time and the industry of the inhabitants, a great part of the land is recovered. It has two principal canals, namely, the New and Old Haven, by which heavily-loaded vessels may enter into the city. Over the Old Haven is a large bridge well built with brick.

Dort was almost reduced to ashes in the year 1457; there being then consumed 2000 houses, with the halls, hospital, and church of Notre Dame: but they are now well provided with fire-engines and watchmen to prevent the like disaster. This city is famous for the meeting of the clergy called the *Senate of Dort*, in which the Calvinists obtained a sentence against the Arminians, who were called the *Remonstrants*. The dispute between the contending parties occasioned strange disorders, skirmishes, and murders, in most of the principal cities. Those ministers who would not subscribe to the decree of the synod were banished, of whom there were above 100. E. Long. 4. 36. N. Lat. 51. 39.

Synod of Dort, a national synod, summoned by authority of the States General, the provinces of Holland, Utrecht, and Overijssel excepted, and held at Dort in 1618. The most eminent divines of the United Provinces, and deputies from the churches of England, Scotland, Switzerland, Bremen, Hesse, and the Palatinate, assembled on this occasion in order to decide the controversy between the Gomarists or Calvinists and Arminians; the latter of whom were declared corrupters of the true religion. But the authority of this synod was far from being universally acknowledged either in Holland or in England. The provinces of Friesland, Zealand, Utrecht, Guelderland, and Groningen, could not be persuaded to adopt their decisions; and they were opposed by the authority of Archbishop Laud and King James I. in England. The reformed churches in France, though at first disposed to give a favourable reception to the decisions of this famous synod, in process of time espoused doctrines very different from those of the Gomarists; and the churches of Brandenburg and Bremen would not suffer their doctors to be tied down to the opinions and tenets of the Dutch divines. The liberty of private judgment with respect to the doctrines of predestination and grace, which the spirit that prevailed among the divines of Dort seemed so much adapted to discourage and suppress, acquired new vigour in consequence of the arbitrary proceedings of this assembly.

DORTMUND, a rich, populous, and imperial city of Germany, in the circle of Westphalia. It is pretty large, but not well built. Formerly it was one of the Hanse towns. Its territory also was formerly a county, and had lords of its own; but since 1504, it hath been possessed entirely by the city.

DORYPHORI (from *doru* spear, and *phor* I bear), an appellation given to the life-guard-men of the Roman emperors. They were held in such high estimation, as frequently to have the command of armies conferred on them.—It was usual also for chief commanders to have their doryphori or life-guard to attend them.

DOSE,

Dort
Doryphori.

Dose
||
Dossil.

DOSE, in pharmacy, &c. the quantity of a medicine to be taken at one time. The word is formed from the Greek *dosis*, which signifies *gift*, or a thing given; from *didomi* *do*, "I give."

DOSITHEANS, DOSITHEI, an ancient sect among the Samaritans in the first century of the Christian era.

Mention is made in Origen, Epiphanius, Jerom, and divers other Greek and Latin fathers, of one Dositheus, the chief of a faction among the Samaritans; but the learned are not at all agreed as to the time wherein he lived. St Jerom, in his dialogue against the Luciferians, places him before our Saviour; wherein he is followed by Drusius, who in his answer to Serrarius places him about the time of Sennacherib king of Assyria. But Scaliger will have him posterior to our Saviour's time: And in effect Origen intimates him to have been contemporary with the apostles; where he observes, that he endeavoured to persuade the Samaritans that he was the Messiah foretold by Moses.

He had many followers; and his sect was still subsisting at Alexandria in the time of the patriarch Eulogius, as appears from a decree of that patriarch published by Photius. In that decree, Eulogius accuses Dositheus of injuriously treating the ancient patriarchs and prophets, and attributing to himself the spirit of prophecy. He makes him contemporary with Simon Magus; and accuses him of corrupting the Pentateuch in divers places, and of composing several books directly contrary to the law of God.

Archbishop Usher takes Dositheus to be the author of all the changes made in the Samaritan Pentateuch, which he argues from the authority of Eulogius. But all we can justly gather from the testimony of Eulogius is, that Dositheus corrupted the Samaritan copies since used by that sect; but that corruption did not pass into all the copies of the Samaritan Pentateuch now in use among us, which vary but little from the Jewish Pentateuch: And in this sense we are to understand that passage in a Samaritan chronicle, where it is said that Doufis, *i. e.* Dositheus, altered several things in the law of Moses. The author of that chronicle, who was a Samaritan by religion, adds, that their high-priest sent several Samaritans to seize Doufis and his corrupted copy of the Pentateuch.

Epiphanius takes Dositheus to have been a Jew by birth, and to have abandoned the Jewish party for that of the Samaritans. He imagines him likewise to have been the author of the sect of the Sadducees: Which seems inconsistent with his being later than our Saviour; and yet the Jesuit Serrarius agrees to make Dositheus the master of Sadoc, from whom the Sadducees are derived.

Tertullian, making mention of the same Dositheus, observes, that he was the first who dared to reject the authority of the prophets by denying their inspiration. But he charges that as a crime peculiar to this sectary, which in reality is common to the whole sect, who have never allowed any but the five books of Moses for divine.

DOSSER, a sort of basket to be carried on the shoulders of men. It is used in carrying the overplus earth from one part of a fortification to another where it is wanted. There are likewise small carts and wheelbarrows for the same use.

DOSSIL, in surgery, is lint made into a cylindric

form, or resembling the shape of dates or olive-stones. Dossils are sometimes secured by a thread tied round their middle.

DOTTEREL, in ornithology. See CHARADRIUS.

DOU, or DOUW, (Gerard). See DOUW.

DOUAY, or DOWAY, a large and strong city of the French Netherlands; situated in E. Long. 3. 0. N. Lat. 50. 25. It is situated on the river Scarpe, in a very fertile and pleasant country. The town is large and populous, and exceedingly well fortified. You enter it by six gates, and the streets from each of these gates lead to the market-place. Here is a venerable old town-house, adorned with the statues of the earls of Flanders, in which the magistrates assemble, and are renewed every thirteen months. Here also are held several country courts for the dependencies of Douay, which contain about 30 villages. The parliament of Douay was at first only a supreme council, established at Tournay in 1668, and erected into a parliament in 1686. But Tournay being taken by the allies in 1709, the parliament was removed to Cambray; and upon the yielding of Tournay to the Austrians by the treaty of Utrecht, the parliament was removed to Douay, where it still continues. This city was erected into an university like that of Louvain by Philip II. because of its being in the middle of so many great cities, and Louvain at so great a distance, that the children on that side of the country were generally sent for their education into France. It contains 14 colleges, all governed and settled after the manner of those at Louvain; and the schools of philosophy, canon and civil law, and physic, are disposed also after the same manner, only the rector here is chosen annually. There is a considerable seminary here of English Roman Catholics, founded by Philip II. of Spain about the year 1569. There is also a great number of convents; and among the rest two English, one of Franciscan friars, the other of Benedictine monks. Douay was taken from the Spaniards by the French king in person in 1667, after a short resistance. That prince made it very strong, and built a fort about a cannon shot below it upon the Scarp, with sluices, by which the adjacent country could be drowned. The allies laid siege to it in 1710, under the command of the Duke of Marlborough; and after a vigorous defence, the town and Fort Scarp surrendered upon honourable terms. It was retaken by the French in 1712, after the suspension of arms between Great Britain and France.

DOUBLE; two of a sort, one corresponding to the other.

DOUBLE Children, Double Cats, Double Pears, &c. Instances of these are frequent in the *Philosoph. Trans.* and elsewhere. See MONSTER.

Sir John Floyer, in the same *Transactions*, giving an account of a *double turkey*, furnishes some reflections on the production of *double animals* in general. Two turkeys, he relates, were taken out of an egg of the common size, when the rest were well hatched, which grew together by the flesh of the breast-bone, but in all other parts were distinct. They seemed less than the ordinary size, as wanting bulk, nutriment, and room for their growth; which latter, too, was apparently the occasion of their cohesion. For, having two distinct cavities in their bodies, and two hearts, they must have arisen from two cicatriculas; and, consequently,

Dotterel
||
Double.

Double.

quently, the egg had two yolks; which is no uncommon accident. He mentions a dried *double chicken* in his possession, which, though it had four legs, four wings, &c. had but one cavity in the body, one heart, and one head; and, consequently, was produced from one cicatricula.

So, Paræus mentions a *double infant*, with only one heart: in which case, the original or flamen of the infant was one, and the vessels regular; only, the nerves and arteries towards the extremities dividing into more branches than ordinary, produced *double parts*.

The same is the case in the *double flowers* of plants, occasioned by the richness of the soil. So it is in the eggs of quadrupeds, &c.

There are, therefore, two reasons of duplicity in embryos: 1. The conjoining or connection of two perfect animals; and, 2. An extraordinary division and ramification of the original vessels, nerves, arteries, &c.

DOUBLE Employment, in music, a name given by M. Rameau to the two different manners in which the chord of the sub-dominant may be regarded and treated, viz. as the fundamental chord of the sixth superadded, or as the chord of the great sixth, inverted from a fundamental chord of the seventh. In reality, the chords carry exactly the same notes, are figured in the same manner, are employed upon the same chord of the tone, in such a manner, that frequently we cannot discern which of the two chords the author employs, but by the assistance of the subsequent chord, which resolves it, and which is different in these different cases.

To make this distinction, we must consider the diatonic progress of the two notes which form the fifth and the sixth, and which, constituting between them the interval of a second, must one or the other constitute the dissonance of the chord. Now, this progress is determined by the motion of the bass. Of these two notes, then, if the superior be the dissonance, it will rise by one gradation into the subsequent chord, the lower note will keep its place, and the higher note will be a superadded sixth. If the lower be the dissonance, it will descend into the subsequent chord, the higher will remain in its place, and the chord will be that of the great sixth. See the two cases of the *double employment* in Rousseau's Musical Dictionary, Plate D, fig. 12.

With respect to the composer, the use which he may make of the double-employment, is to consider the chord in its different points of view, that from thence he may know how to make his entrance to it, and his exit from it; so that having arrived, for instance, at the chord of the superadded sixth, he may resolve it as a chord of the great sixth, and reciprocally.

M. D'Alembert has shown, that one of the chief uses of the double-employment is, that we be able to carry the diatonic succession of the gamut even to an octave, without changing the mode, at least whilst we rise; for in descending we must change it. Of this gamut and its fundamental bass, an example will be found in Rousseau's Musical Dictionary, Plate D, fig. 13. It is evident, according to the system of M. Rameau, that all the harmonic successions which result from it, are in the same tone: for, in strictness, no other chords are there employed but three, that of the tonic, that of the dominant, and that of the sub-dominant; as this last, in the double-employment, constitutes the seventh from the second note, which is employed upon the sixth.

Double.

With respect to what M. D'Alembert adds in his Elements of Music, p. 80. and which he repeats in the Encyclopédie, article *Double-emploi*, viz. that the chord of the seventh *re fa la ut*, though we should even regard it only as an inversion of *fa la ut re*, cannot be followed by the chord *ut mi sol ut*; "I cannot (says Rousseau) be of his opinion in this point.

"The proof which he gives for it is, that the dissonance *ut* of the first chord cannot be resolved in the second; and this is true, since it remains in its place: but in this chord of the seventh *re fa la ut*, inverted from this chord of the superadded sixth *fa la ut re*, it is not the *ut*, but the *re*, which is the dissonance; which, of consequence, ought to be resolved in ascending upon *mi*, as it really does in the subsequent chord; so that this procedure in the bass itself is forced, which, from *re*, cannot without an error return to *ut*, but ought to ascend to *mi*, in order to resolve the dissonance.

"M. D'Alembert afterwards shows, that this chord *re fa la ut*, when preceded and followed by that of the tonic, cannot be authorized by the double-employment: and this is likewise very true; because this chord, tho' figured with a 7, is not treated as a chord of the seventh, neither when we make our entrance to it, nor our exit from it; or at least that it is not necessary to treat it as such, but simply as an inversion of the superadded sixth, of which the dissonance is the bass: in which case we ought by no means to forget, that this dissonance is never prepared. Thus, though in such a transition the double-employment is not in question, though the chord of the seventh be no more than apparent, and impossible to be resolved by the rules, this does not hinder the transition from being proper and regular, as I have just proved to theorists, I shall immediately prove to practical artists, by an instance of this transition; which certainly will not be condemned by any one of them, nor justified by any other fundamental bass except my own. (See the Musical Dictionary, Plate D, fig. 14.)

"I acknowledge, that this inversion of the chord of the sixth superadded, which transfers the dissonance to the bass, has been censured by M. Rameau. This author, taking for a fundamental chord the chord of the seventh, which results from it, rather chose to make the fundamental bass descend diatonically, and resolve one seventh by another, than to unfold this seventh by an inversion. I had dissipated this error, and many others, in some papers which long ago had passed into the hands of M. D'Alembert, when he was composing his Elements of Music; so that it is not his sentiment which I attack, but my own opinion which I defend."

For what remains, the double-employment cannot be used with too much reserve, and the greatest masters are the most temperate in putting it in practice.

DOUBLE Fichy, or *Fiché*, in heraldry, the denomination of a cross, when the extremity has two points; in contradistinction to *fiché*, where the extremity is sharpened away to one point.

DOUBLE Octave, in music, an interval composed of fifteen notes in diatonic progression; and which, for that reason, is called a *fifteenth*. "It is (says Rousseau) an interval composed of two octaves, called by the Greeks *disdiapason*."

It deserves, however, to be remarked, that in intervals less distant and compounded, as in the *third*, the *fifth*,

Doublet. the *simple octave*, &c. the lowest and highest extremes are included in the number from whence the interval takes its name. But, in the *double octave*, when termed a fifteenth, the simple number of which it is composed gives the name. This is by no means analogical, and may occasion some confusion. We should rather choose, therefore, to run any hazard which might occur from uniformly including all the terms of which the component intervals consist, and call the *double octave* a sixteenth, according to the general analogy. See INTERVAL.

DOUBLET, among lapidaries, implies a counterfeit stone composed of two pieces of crystal, and sometimes glass softened, together with proper colours between them; so that they make the same appearance to the eye as if the whole substance of the crystal had been tinged with these colours.

The impracticability of imparting tinges to the body of crystals, while in their proper and natural state, and the softness of glass, which renders ornaments made of it greatly inferior in wear to crystal, gave inducements to the introduction of colouring the surface of crystal wrought in a proper form, in such a manner, that the surfaces of two pieces so coloured being laid together, the effect might appear the same as if the whole substance of the crystal had been coloured. The crystals, and sometimes white transparent glass so treated, were called *doublets*; and at one time prevailed greatly in use on account of the advantages, with respect to wear, such doublets had, when made of crystal, over glass, and the brightness of the colours which could with certainty be given to counterfeit stones this way, when coloured glass could not be procured, or at least not without a much greater expence. Doublets have not indeed the property which the others have, of bearing to be set transparent, as is frequently required in drops of ear-rings and other ornaments: but when mounted in rings, or used in such manner that the sides of the pieces, where the joint is made, cannot be inspected, they have, when formed of crystal, the title to a preference to the coloured glass; and the art of managing them is therefore, in some degree, of the same importance with that of preparing glass for the counterfeiting gems; and is therefore properly an appendage to it, as being entirely subservient to the same intention. The manner of making doublets is as follows:

Let the crystal or glass be first cut by the lapidaries in the manner of a brilliant, except that, in this case, the figure must be composed from two separate stones, or parts of stones, formed in the manner of the upper and under parts of a brilliant, if it was divided in an horizontal direction, a little lower than the middle. After the two plates of the intended stone are thus cut, and fitted so exactly that no division can appear when they are laid together, the upper part must be polished ready for setting; and then the colour must be put betwixt the two plates by this method. "Take of Venice or Cyprus turpentine two scruples; and add to it one scruple of the grains of mallich chosen perfectly pure, free from foulness, and previously powdered. Melt them together in a small silver or brass spoon ladle, or other vessel, and put to them gradually any of the coloured substances below mentioned, being first well powdered; stirring them together as the colour is put

in, that they may be thoroughly commixed. Warm then the doublets to the same degree of heat as the melted mixture; and paint the upper surface of the lower part, and put the upper one instantly upon it, pressing them to each other, but taking care that they may be conjoined in the most perfectly even manner. When the cement or paint is quite cold and set, the redundant part of it, which has been pressed out of the joint of the two pieces, should be gently scraped off the side, till there be no appearance of any colour on the outside of the doublets: and they should then be skilfully set; observing to carry the mounting over the joint, that the upper piece may be well secured from separating from the under one."

The colour of the ruby may be best imitated, by mixing a fourth part of carmine with some of the finest crimson lake that can be procured.

The sapphire may be counterfeited by very bright Prussian blue, mixed with a little of the above mentioned crimson lake, to give it a cast of the purple. The Prussian blue should not be very deep-coloured, or but little of it should be used: for otherwise, it will give a black shade that will be injurious to the lustre of the doublets.

The emerald may be well counterfeited by distilled verdigrease, with a little powdered aloes. But the mixture should not be strongly heated, nor kept long over the fire after the verdigrease is added: for the colour is to be soon impaired by it.

The resemblance of the garnet may be made by dragon's blood; which, if it cannot be procured of sufficient brightness, may be helped by a very small quantity of carmine.

The amethyst may be imitated by the mixture of some Prussian blue with the crimson lake; but the proportions can only be regulated by direction, as different parcels of the lake and Prussian blue vary extremely in the degree of strength of the colour.

The yellow topazes may be counterfeited by mixing the powdered aloes with a little dragon's blood, or by good Spanish anotto: but the colour must be very sparingly used, or the tinge will be too strong for the appearance of that stone.

The chrysolite, hyacinth, vinegar garnet, eagle marine, and other such weaker or more diluted colours, may be formed in the same manner, by lessening the proportions of the colours, or by compounding them together correspondently to the hue of the stone to be imitated; to which end it is proper to have an original stone, or an exact imitation of one, at hand when the mixture is made, in order to the more certain adapting the colours to the effect desired: and when these precautions are taken, and the operation well conducted, it is practicable to bring the doublets to so near a resemblance of the true stones, that even the best judges cannot distinguish them, when well set, without a peculiar manner of inspection.

There is, however, an easy method of distinguishing doublets, which is only to behold them betwixt the eye and light, in such position, that the light may pass through the upper part and corners of the stone; when it will easily be perceived that there is no colour in the body of the stone.

DOUBLETS, a game on dice within tables; the men, which are only 15, being placed thus: Upon the
lice,

**Doublet,
Doublets.**

Doubling
||
Doubting.

fice, cinque, and quatre points, there stand three men a-piece; and upon the trey, duce, and ace, only two. He that throws highest hath the benefit of throwing first, and what he throws he lays down, and so doth the other: what the one throws, and hath not, the other lays down for him, but on his own account; and thus they do till all the men are down, and then they bear. He that is down first, bears first; and will doubtless win the game, if the other throws not doublets to overtake him: which he is sure to do, since he advances or bears as many as the doublets make, viz. eight for two fours.

DOUBLING, in the military art, is the putting two ranks or files of soldiers into one. Thus, when the word of command is, *double your ranks*, the second, fourth, and sixth ranks march into the first, third, and fifth, so that the six ranks are reduced to three, and the intervals between the ranks become double what they were before.

DOUBLING, among hunters, who say that a hare doubles, when she keeps in plain fields, and winds about to deceive the hounds.

DOUBLING, in the manege, a term used of a horse, who is said to double his reins, when he leaps several times together, to throw his rider: thus we say, *the ramingue doubles his reins, and makes pontlevis*.

DOUBLING, in navigation, the act of sailing round, or passing beyond, a cape or promontory, so as that the cape or point of land separates the ship from her former situation, or lies between her and any distant observer.

DOUBLING-UPON, in naval tactics, the act of inclosing any part of a hostile fleet between two fires, or of cannonading it on both sides.

It is usually performed by the van or rear of that fleet which is superior in number, taking the advantage of the wind, or of its situation and circumstances, and tacking or veering round the van or rear of the enemy, who will thereby be exposed to great danger, and can scarcely avoid being thrown into a general confusion.

DOUBLON, or DUBLOON, a Spanish and Portuguese coin, being the double of a PISTOLE.

DOUBTING, the act of with-holding our assent from any proposition, on suspicion that we are not thoroughly apprised of the merits thereof, or from not being able peremptorily to decide between the reasons for and against it.

Doubting is distinguished by the schoolmen into two kinds, *dubitatio sterilis*, and *dubitatio efficax*. The former is that where no determination ensues: in this manner the Sceptics and Academics doubt, who with-hold their assent from every thing. See SCEPTICS, &c.

The latter is followed by judgment, which distinguishes truth from falsehood: such is the doubting of the Peripatetics and Cartesians. The last in particular are perpetually inculcating the deceitfulness of our senses, and tell us that we are to doubt of every one of their reports, till they have been examined and confirmed by reason. On the other hand, the Epicureans teach, that our senses always tell truth; and that, if you go ever so little from them, you come within the province of doubting. See CARTESIANS, EPICUREANS, &c.

DOUBTING, in rhetoric, a figure whereon the orator appears some time fluctuating, and undetermined

N^o 103.

what to do or say. Tacitus furnishes us with an instance of doubting, almost to a degree of distraction, in those words of Tiberius written to the senate: *Quid scribam, P. S. aut quomodo scribam, aut quid omnino non scribam hoc tempore, dum me deaque pejus perdant quam perire quotidie sentio, si scio*.

DOUCETS, or DOULCETS, among sportsmen, denote the testes of a deer or stag.

DOUCINE, in architecture, a moulding concave above and convex below, serving commonly as a cymatium to a delicate cornice. It is likewise called GULA.

DOVE, in ornithology. See COLUMBA.

DOVE-TAILING, in carpentry, is the manner of fastening boards together by letting one piece into another, in the form of the tail of a dove. The dove-tail is the strongest of the assemblages or jointings; because the tenon, or piece of wood which is put into the other, goes widening to the extreme, so that it cannot be drawn out again, by reason the extreme or tip is bigger than the hole.

DOVER, a borough and port town of England, in the county of Kent, situated in E. Long. 0. 25. N. Lat. 51. 10. It sends two members to parliament, styled *barons of the Cinque-ports*, whereof Dover is the chief. Dover gave the title of duke in the Queensberry family, but extinct: now a revived barony in the York family.

By the Romans this town was named *Dubris*, and by the Saxons *Dofra*, probably from the British word *Dour*, which signifies water. The convenience of its situation drew the attention of the Roman governors, who ruled here while they possessed this part of the island; and there still remain indubitable testimonies of their care and respect for this important place. For the defence of the town, the Romans, or, according to some, Arviragus, a British king, their confederate, by cutting out walls with infinite labour in the solid rock, constructed a stony fortress; and, as its venerable remains still prove, erected also a light-house for the benefit of navigation. The Saxons, Danes, and Normans, had a very high opinion of this place; and when the barons invited over the young prince, afterwards Louis VIII. of France, his father Philip Augustus conceived a bad opinion of the expedition, because the castle and port of Dover were held for king John, though a great part of the kingdom had submitted to Louis. In its most flourishing state, the fortress was impregnable, and the town a very opulent emporium. It had 21 wards, each of which furnished a ship for the public service, 10 gates, 7 parish-churches, many religious houses, hospitals, and other public edifices. The decay of the town was brought on by that of the harbour. To recover this, Henry VIII. spent no less than 63,000l. in constructing piers, and 5000l. in building a castle between this and Folkestone, called *Sandgate*; where the shore was flat, and the landing easy. Notwithstanding all this expence, however, it was again choaked up in the reign of queen Elizabeth, by whom it was again cleared at a vast expence, so that ships of some hundred tons could enter it. Since that time it has again declined, notwithstanding of many efforts for its relief, and great assistance from time to time given by parliament for this purpose. As the haven, however,

Doucets
||
Dover.

Dover. is still capable of receiving vessels of small burden; and as the packets to France and Flanders are stationed here in time of peace, it is still a place of some consequence, and the people are active and industrious.

DOVER Straits, the narrow channel between Dover and Calais, which separates our island from the opposite continent. Britain is supposed by many to have been once peninsulated, the present straits occupying the site of the isthmus which joined it to Gaul. "No certain cause

* *Arch. Zool.*
Vol. I.
Introd.
p. ii.

(says Mr Pennant *) can be given for the mighty convulsion which tore us from this continent; whether it was rent by an earthquake, or whether it was worn through by the continual dashing of the waters, no Pythagoras is left to solve the *Fortuna locorum*:

*Vidi ego, quod fuerat quondam solidissima tellus
Esse fretum.*

But it is most probable, that the great philosopher alluded to the partial destruction of the *Atlantica insula*, mentioned by Plato as a distant tradition in his days. It was effected by an earthquake and a deluge, which might have rent asunder the narrow isthmus in question, and left Britain, large as it seems at present, the mere wreck of its original size. The Scilly isles, the Hebrides, Orkneys, Schetlands, and perhaps the Feroe islands, may possibly be no more than fragments of the once far-extended region. I have no quarrel about the word *island*. The little isthmus, compared to the whole, might have been a junction never attended to in the limited navigations of very early times. The peninsula had never been wholly explored, and it passed with the ancients for a genuine island. The correspondence of strata on part of the opposite shores of Britain and France, leaves no room to doubt but that they were once united. The chalky cliffs of Blancnez between Calais and Bologne, and those to the westward of Dover, exactly tally: the last are vast and continued; the former short, and the termination of the immense bed. Between Bologne and Folkestone (about six miles from the latter) is another memorial of the junction of the two countries; a narrow submarine hill, called the *Rip-raps*, about a quarter of a mile broad, and ten miles long, extending eastwards towards the Goodwin Sands. Its materials are boulder-stones, adventitious to many strata. The depth of water on it, in very low spring-tides, is only fourteen feet. The fishermen from Folkestone have often touched it with a fifteen feet oar; so that it is justly the dread of navigators. Many a tall ship has perished on it, and sunk instantly into twenty-one fathoms water. In July 1782, the *Belleisle* of sixty-four guns struck, and lay on it during three hours; but, by starting her beer and water, got clear off."

These celebrated straits are only twenty-one miles wide in the narrowest part. From the pier at Dover to that at Calais is twenty-four. It is conjectured, that their breadth lessens, and that they are two miles narrower than they were in ancient times. An accurate observer of fifty years remarks to me, that the increased height of water, from a decrease of breadth, has been apparent even in that space. The depth of the channel at a medium in highest spring-tides is about twenty-five fathoms. The bottom either coarse sand or rugged scars, which have for ages unknown resisted the attrition of the currents. From the straits

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both eastward and westward is a gradual increase of depth through the channel to a hundred fathoms, till soundings are totally lost or unattended to. The spring-tides in the straits rise on an average twenty-four feet, the neap-tides fifteen. The tide flows from the German sea, passes the straits, and meets, with a great rippling, the western tide from the ocean between Fairleigh near Hastings and Bologne; a proof that, if the separation of the land was effected by the seas, it must have been by the overpowering weight of those of the north.

DOVER, a town of Delaware in North America. It is the chief town of the county of Kent in the Delaware state, and is the seat of government. It stands on Jones's creek, a few miles from the Delaware river, and consists of about 100 houses, principally of brick. Four streets intersect each other at right angles, in the centre of the town, whose incidencies form a spacious parade, on the east side of which is an elegant state-house of brick. The town has a lively appearance, and drives on a considerable trade with Philadelphia. Wheat is the principal article of export. The landing is five or six miles from the town of Dover.

DOUGLAS (Lord). See (*History of*) SCOTLAND.

DOUGLAS (Gavin), bishop of Dunkeld in Scotland, was the third son of Archibald earl of Angus, and born in the year 1474. Where he was educated, is not known; but it is certain that he studied theology: a study, however, which did not estrange him from the muses; for he employed himself at intervals in translating into beautiful verse the poem of Ovid *de Remedio Amoris*. The advantages of foreign travel, and the conversation of the most learned men in France and Germany, to whom his merit procured the readiest access, completed his education. With his superior recommendations and worth it was impossible he could remain unnoticed. His first preferment was to be provost of the collegiate church of St Giles in Edinburgh; a place at that time of great dignity and revenue. In the year 1514, the queen mother, then regent of Scotland, appointed Douglas abbot of Aberbrothock, and soon after archbishop of St Andrew's; but the queen's power not being sufficient to establish him in the possession of that dignity, he relinquished his claim in favour of his competitor Foreman, who was supported by the pope. In 1515, he was by the queen appointed bishop of Dunkeld; and that appointment was soon after confirmed by his holiness Leo X. Nevertheless it was some time before he could obtain peaceable possession of his see. The duke of Albany, who in this year was declared regent, opposed him because he was supported by the queen; and, in order to deprive him of his bishopric, accused him of acting contrary to law in receiving bulls from Rome. On this accusation he was committed to the castle of Edinburgh, where he continued in confinement above a year; but the regent and the queen being at last reconciled, he obtained his liberty, and was consecrated bishop of Dunkeld. In 1517, he attended the duke of Albany to France; but returned soon after to Scotland. In 1521, the disputes between the earls of Arran and Angus having thrown the kingdom into violent commotion, our prelate retired to England, where he became intimately acquainted with Polydore Virgil the historian. He

Dover,
Douglas.

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died

Douglas,
Douw.

died in London of the plague in 1522; and was buried in the Savoy. He wrote, 1. *The Palace of Honour*: a most ingenious poem under the similitude of a vision; in which he paints the vanity and inconstancy of all worldly glory. It abounds with incidents, and a very rich vein of poetry. The palace of happiness, in the picture of Cebes, seems to be the ground-work of it. 2. *Aurea Narrationes*: a performance now lost; in which, it is said, he explained, in a most agreeable manner, the mythology of the poetical fictions of the ancients. 3. *Comædia aliquot sacra*: None of which are now to be found. 4. *Thirteen Bukes of Eneades*, of the famous poet Virgil, translated out of Latin verses into Scottish metre, every buke having its particular prologue. Imprinted at London 1553, in 4to; and reprinted at Edinburgh 1710, in folio. The last is the most esteemed of all his works. He undertook it at the desire of lord Henry Sinclair, a munificent patron of arts in those times: and he completed it in 18 months; a circumstance which his admirers are too fond of repeating to his advantage. David Hume of Godscroft, an author of uncommon merit, and an admirable judge of poetry, gives the following testimony in his favour. "He wrote (says he) in his native tongue divers things; but his chiefest work is his translation of Virgil, yet extant, in verse: in which he ties himself so strictly as is possible; and yet it is so well expressed, that whosoever will essay to do the like, will find it a hard piece of work to go through with it. In his prologues before every book, where he hath his liberty, he sheweth a natural and ample vein of poetry, so pure, pleasant, and judicious, that I believe there is none that hath written before or since but cometh short of him." It has been said, that he compiled an historical treatise *De rebus Scoticis*; but no remain of it hath descended to the present times.

DOUGLAS, the principal town of the Isle of Man, and which has lately increased both in trade and buildings. The harbour, for ships of a tolerable burden, is the safest in the island, and is much mended by a fine mole that has been built. It is seated on the eastern side. W. Long. 4. 25. N. Lat. 54. 7.

DOUW (Gerhard), a celebrated painter, was born at Leyden in 1613; and received his first instructions in drawing and design from Bartholomew Dolendo an engraver, and also from Peter Kouwhoorn a painter on glass; but at the age of fifteen he became a disciple of Rembrandt. In that famous school he continued for three years; and then found himself qualified to study nature, the most unerring director.

From Rembrandt he learned the true principles of colouring, and obtained a complete knowledge of the chiaro-scuro; but to that knowledge he added a delicacy of pencil, and a patience in working up his colours to the highest degree of neatness, superior to any other master. He therefore was more pleased with those pictures of Rembrandt which were painted in his youth than those by which he was distinguished in his more advanced age; because the first seemed finished with more care and attention, the latter with more boldness, freedom, and negligence, which was quite opposite to the taste of Douw. But although his manner appears so different from that of his master, yet it was to Rembrandt alone that he owed all

that excellence in colouring by which he triumphed over all the artists of his own country.

His pictures usually are of a small size, with figures so exquisitely touched, so transparent, so wonderfully delicate, as to excite astonishment as well as pleasure. He designed every object after nature, and with an exactness so singular, that each object appears as perfect as nature itself, in respect to colour, freshness, and force. His general manner of painting portraits was by the aid of a concave mirror, and sometimes by looking at the object through a frame with many exact squares of fine silk. But the latter custom is disused, as the eye of a good artist seems a more competent rule, though the use of the former is still practised by painters in miniature.

It is almost incredible what vast sums have been given and are given at this day for the pictures of Douw, even in his own country; as also in Italy and every polite part of Europe: for he was exceedingly curious in finishing them, and patiently assiduous beyond example. Of that patience Sandrart gives a strong proof in a circumstance which he mentions relative to this artist. He says, that having once, in company with Bamboccio, visited Gerhard Douw, they could not forbear to admire the prodigious neatness of a picture which he was then painting, in which they took particular notice of a broom; and expressing their surprise at the excessive neatness of the finishing that minute object, Douw told them he should spend three days more in working on that broom before he should account it entirely complete. In a family picture of Mrs Spiering, the same author says, that the lady had sat five days for the finishing one of her hands that leaned on an arm-chair. For that reason not many would sit to him for their portraits; and he therefore indulged himself mostly in works of fancy, in which he could introduce objects of still life, and employ as much time on them as suited his own inclination. Houbraken testifies, that his great patron Mr Spiering allowed him a thousand guilders a-year, and paid beside whatever he demanded for his pictures, and purchased some of them for their weight in silver; but Sandrart, with more probability, assures us, that the thousand guilders a-year were paid to Gerhard, on no other consideration than that the artist should give his benefactor the option of every picture he painted, for which he was immediately to receive the utmost of his demand. This great master died in 1674, aged 61.

Douw appears incontestably to be the most wonderful in his finishing of all the Flemish masters. Every thing that came from his pencil is precious, and his colouring hath exactly the true and the lovely tints of nature; nor do his colours appear tortured, nor is their vigour lessened by his patient pencil; for whatever pains he may have taken, there is no look of labour or stiffness; and his pictures are remarkable, not only for retaining their original lustre, but for having the same beautiful effect at a proper distance as they have when brought to the nearest view.

At Turin are several pictures by Gerhard Douw, wonderfully beautiful; especially one, of a Doctor attending a sick woman, and surveying an urinal. The execution of that painting is astonishingly fine, and although the shadows appear a little too dark, the whole

Doucia
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Down.

whole has an inexpressible effect. In the gallery at Florence there is a night-piece by candle-light, which is exquisitely finished; and in the same apartment, a mountebank attended by a number of figures, which it seems impossible either sufficiently to commend or to describe.

DOULEIA, Δουλεια, among the Athenians, a kind of punishment, by which the criminal was reduced into the condition of a slave. It was never inflicted upon any but the *ατιμοι*, *sojourners* and *freed servants*.

To DOUSE, in sea language, is to lower suddenly, or slacken; and it is applied to a sail in a squall of wind, an extended hawser, &c.

DOWAGER, DOTISSA (*q. d.* a widow endowed, or that has a jointure), a title, or addition, applied to the widows of princes, dukes, earls, and persons of high rank only.

Queen DOWAGER, is the widow of the king, and as such enjoys most of the privileges belonging to her as queen consort: but it is not high treason to violate her chastity or conspire her death, because the succession is not endangered thereby; but no man can marry her without special license from the king, on pain of forfeiting his lands and goods. See QUEEN.

DOWER, (*Dotarium, Doarium, or Dos*), a portion of lands or tenements which a widow enjoys for term of life from her husband, in case she survives him: and which, at her death, descends to their children. But she must have been the wife of the party at the time of his decease; or not divorced *a vinculo matrimonii*: nor, if she has eloped from her husband, and lives with an adulterer, shall she be intitled to dower, unless her husband be voluntarily reconciled to her. The widows of traitors are also barred of their dower by 5 and 6 Ed. VI. cap. 11. but not the widows of felons. An alien cannot be endowed, unless she be queen-consort. And if a woman levies a fine with her husband, or if a common recovery be had with the husband and wife of the husband's lands, she is barred of her dower. A widow, clear of these impediments, is by law intitled to be endowed of all lands and tenements, of which her husband was seised in fee-simple or fee-tail at any time during the coverture; and of which any issue she might have had might by possibility have been heir. See JOINTURE.

DOWN, a county of Ireland in the province of Ulster, bounded on the east and south by St George's channel; on the west by the county of Armagh; and on the north by the county of Antrim. It lies opposite to the Isle of Man, Cumberland, and Westmoreland; and the north part of it fronts the Mull of Galloway in Scotland, and is about 44 miles from it. It is about 44 miles in length and 30 in breadth. It sends 14 members to parliament, two for the county, and 12 for the following boroughs, Down-Patrick, Newry, Newtown, Killeleagh, Bangor, and Hillborough.

This county is rough and full of hills, and yet the air is temperate and healthy. The soil naturally produces wood, unless constantly kept open and ploughed; and the low grounds degenerate into bogs and moss, where the drains are neglected. But by the industry of the inhabitants it produces good crops of corn, particularly oats; and, where marl is found, barley.

This last is exported from Killogh to Dublin. The staple commodity of this county is the linen manufacture.

DOWN, or *Down-Patrick*, a town of Ireland, in the county of Down, is one of the most ancient in that kingdom. It is a market-town and a bishoprick, said to be erected in the fifth century by St Patrick, but is now united to the see of Connor. Within 200 paces of the town, on the ascent of a hill, are the ruins of an old cathedral, remarkable for the tomb of St Patrick the founder, in which they say the bodies of St Bridget and St Columb are also laid. The town, which is seated on the south corner of Lough Coin, now called the *lake of Strangford*, is adorned with several handsome public buildings. Among the hills, and in many islands, are flights of swans and other water-fowl; and the Lough abounds with salmon, mullets, and other sea-fish. About a mile from this town is St Patrick's well, which many people frequent to drink at some seasons of the year, and others to perform a penance enjoined them by the popish priests. The linen manufacture is carried on here, as it is in several places in this country. W. Long. 5. 50. N. Lat. 54. 23.

DOWN, the fine feathers from the breasts of several birds, particularly of the duck kind.—That of the eider-duck (see ANAS, n^o 17.) is the most valuable. These birds pluck it from their breasts and line their nests with it. We are told that the quantity of down found in one nest more than filled the crown of an hat, yet weighed no more than three quarters of an ounce. Br. Zool.—Three pounds of this down may be compressed into a space scarce bigger than one's fist; yet is afterwards so dilatible as to fill a quilt five feet square. Salern. Orn. p. 416.—That found in the nests is most valued, and termed *live down*; it is infinitely more elastic than that plucked from the dead bird, which is little esteemed in Iceland. The best sort is sold at 45 fift per pound when cleansed, and at 16 when not cleansed. There are generally exported every year, on the company's account, fifteen hundred or two thousand pounds of both sorts, exclusive of what is privately exported by foreigners. In 1750 the Iceland Company sold as much in quantity of this article as amounted to three thousand seven hundred and forty-five banco-dollars, besides what was sent directly to Gluckstadt.—Von Troil. p. 146.

DOWN or hair of plants. See HAIR.

DOWNETON, or DUNKTON, a borough-town of Wiltshire, five miles south of Salisbury. It sends two members to parliament.

DOWNHAM, a market-town of Norfolk, 10 miles south of Lynn, famous for its good butter; there being 1000, and sometimes 2000, firkins bought here every Monday, and sent up the river Ouse to Cambridge, from whence it is conveyed to London in the Cambridge-waggons.

DOWNS, a bank or elevation of sand, which the sea gathers and forms along its shores; and which serves it as a barrier. The word is formed from the French *dune*, of the Celtic *dum*, a "mountain." Charles de Visch. in his *Compend. Chronolog. Exord. & Progress. Abbat. Clariss. B. Mariæ, de Dunis*, says, *Vallem reperit arenarum collibus (quos incolæ Duynen vocant) undique cinctam*.

Downs are particularly used for a famous road for ships,

Down
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Downs.

Dowry ships, along the eastern coast of the county of Kent, from Dover to the North Foreland; where both the outward and homeward-bound ships frequently make some stay; and squadrons of men of war rendezvous in time of war.

It affords excellent anchorage; and is defended by the castles of Deal, Dover, and Sandwich.

DOWRY, the money or fortune which the wife brings her husband in marriage: it is otherwise called *maritagium*, marriage-goods, and differs from dower. See **DOWER**.

DOXOLOGY, an hymn used in praise of the Almighty, distinguished by the title of *greater* and *lesser*.

The lesser doxology was anciently only a single sentence, without response, running in these words, *Glory be to the Father, and to the Son, and to the Holy Ghost, world without end, Amen.* Part of the latter clause, *As it was in the beginning, is now, and ever shall be*, was inserted some time after the first composition. Some read this ancient hymn, *Glory be to the Father, and to the Son with the Holy Ghost.* Others, *Glory be to the Father in or by the Son, and by the Holy Ghost.* This difference of expression occasioned no disputes in the church, till the rise of the Arian heresy; but when the followers of Arius began to make use of the latter as a distinguishing character of their party, it was entirely laid aside by the Catholics, and the use of it was enough to bring any one under suspicion of herodoxy.

The doxology was used at the close of every solemn office. The western church repeated it at the end of every psalm, and the eastern church at the end of the last psalm. Many of their prayers were also concluded with it, particularly the solemn thanksgiving or consecration prayer at the eucharist. It was also the ordinary conclusion of their sermons.

The greater doxology, or angelic hymn, was likewise of great note in the ancient church. It began with these words, which the angels sung at our Saviour's birth, *Glory be to God on high, &c.* It was chiefly used in communion service, and in men's private devotions. Both the doxologies have a place in the church of England, the former being repeated after every psalm, and the latter used in the communion service.

DRABA, in botany: A genus of the filiculosa order, belonging to the tetradynamia class of plants; and in the natural method ranking under the 39th order, *Siliculosæ*. The filicula is entire, and oval oblong; with the valves a little plane, parallel to the partition: there is no style. There are six species; of which the only one worthy of notice is the verna, or early whitlow-grass. It hath naked stalks, with leaves a little ferrated. The blossoms are white, and at night the flowers hang down. It grows on old walls and dry banks. It is one of the earliest flowering plants we have, and is good to eat as a salad. Goats, sheep, and horses eat it; cows are not fond of it; swine refuse it.

DRABLER, in the sea-language, a small sail in a ship, which is the same to a bonnet that a bonnet is to a course, and is only used when the course and bonnet are too shoal to clothe the mast. See **BONNET** and **COURSE**.

DRABLING, in angling, is a method of catch-

ing barbel. Take a strong line of six yards; which, before you fasten it to your rod, must be put through a piece of lead, that if the fish bite, it may slip to and fro, and that the water may something move it on the ground; bait with a lobe worm well secured, and so by its motion the barbel will be enticed into the danger without suspicion. The best places are in running water near piles, or under wooden bridges, supported with oaks floated and slimy.

DRABS, in the salt-works, a kind of wooden boxes for holding the salt when taken out of the boiling pan; the bottoms of which are made shelving or inclining forwards, that the briny moisture of the salt may drain off.

DRAC, an imaginary being, much dreaded by the country people in many parts of France. The dracs are supposed to be malicious or at least tricksome demons; but, which is very rare, if one of them happens to take a fancy to a man or woman, they are sure to be the better for it. They are still said to lay gold cups and rings on the surface over pits and rivers, as baits to draw women and children in; though their usual dwelling is some old empty house, whence they make excursions in human form, visible or invisible as best suits their purpose. The country folks shudder at the very name of the drac. Some are positive that they have seen him; for happy indeed is that village in which there is not a house execrated as the lurking-place of this tremendous drac.

DRACÆNA, in botany; a genus of the monogynia order, belonging to the hexandria class of plants. The corolla is sexpartite and erect; the filaments a little thicker about the middle; the berry trilocular and monospermous.

DRACHM, a Grecian coin, of the value of sevenpence three farthings. Drachm is also a weight used by our physicians; containing just sixty grains three scruples, or the eighth part of an ounce.

DRACO, a celebrated lawgiver of Athens. When he exercised the office of archon, he made a code of laws for the use of his citizens, which, on account of their severity, were said to be written in letters of blood. By them idleness was punished with as much severity as murder, and death was denounced against the one as well as the other. Such a code of rigorous laws gave occasion to a certain Athenian to ask of the legislator, why he was so severe in his punishments? and Draco gave for answer, that as the smallest transgression had appeared to him deserving death, he could not find any punishment more rigorous for more atrocious crimes. These laws were at first enforced, but they were often neglected on account of their extreme severity; and Solon totally abolished them, except that one which punished a murderer with death. The popularity of Draco was uncommon, but the gratitude of his admirers proved fatal to him. When once he appeared on the theatre, he was received with repeated applause; and the people, according to the custom of the Athenians, showed their respect to their lawgiver by throwing garments upon him. This was done in such profusion, that Draco was soon hid under them, and smothered by the too great veneration of his citizens. He lived about 624 years before the Christian era.

DRACO, the *Dragon*, in zoology, a genus belonging

Drabs
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Draco

Draco
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Dracon-
tium.
Plate
CLXIV.

ing to the order of *amphibia reptilia*; the characters of which are these: it has four legs, a cylindrical tail, and two membranaceous wings, radiated like the fins of a fish, by which he is enabled to fly, but not to any great distance at a time. There are two species. 1. The *volans*, or flying dragon, with the wings entirely distinct from the fore-legs. It is found in Africa and the East Indies. 2. The *præpos*, with the wings fixed to the fore-legs. It is a native of America. They are both harmless creatures; and feed upon flies, ants, and small insects.

DRACO Volans, in meteorology, a fiery exhalation, frequent in marshy and cold countries.

It is most common in summer; and though principally seen playing near the banks of rivers, or in boggy places, yet sometimes mounts up to a considerable height in the air, to the no small terror of the amazed beholders; its appearance being that of an oblong, sometimes roundish, fiery body, with a long tail. It is entirely harmless, frequently sticking to the hands and cloaths of people without injuring them in the least.

DRACO, in astronomy, a constellation of the northern hemisphere; whose stars, according to Ptolemy, are 81; according to Tycho, 32; according to Hevelius, 40; according to Bayer, 33; and according to Mr Flamsteed, 80. See ASTRONOMY, n° 406.

DRACOCEPHALUM, DRAGON'S HEAD; a genus of the *gymnospermia* order, belonging to the *didynamia* class of plants. The throat of the corolla is inflated, the upper lip concave. There are 13 species, most of them herbaceous, annual, or perennial plants, from 18 inches to three feet high, garnished mostly with entire leaves, and whorled spikes of small monopetalous and ringent flowers of a blue, white, or purple colour. They are all easily propagated by seeds, which may be sown either in the spring or autumn; and after the plants are come up they will require no other culture but to be kept clear from weeds.

DRACONARIUS, in antiquity, DRAGON-BEARER. Several nations, as the Persians, Parthians, Scythians, &c. bore dragons on their standards; whence the standards themselves were called *dracones*, "dragons." The Romans borrowed the same custom from the Parthians; or, as Casaubon has it, from the *Dacæ*; or, as Codin, from the Assyrians.

The Roman *dracones* were figures of dragons painted in red on their flags, as appears from Ammianus Marcellinus: but among the Persians and Parthians they were like the Roman eagles, figures in full relief; so that the Romans were frequently deceived, and took them for real dragons.

The soldier who bore the dragon or standard was called by the Romans *draconarius*; and by the Greeks *δρακοναριος* and *δρακοντεφορος*; for the emperors carried the custom with them to Constantinople.

DRACONTIC MONTH, the time of one revolution of the moon from her ascending node, called *caput draconis*, to her return thither.

DRACONTIUM, DRAGONS: A genus of the *polyandria* order, belonging to the *gynandria* class of plants; and in the natural method ranking under the first order, *Palmæ*. The *spatha* is cymbiform, or shaped like a boat; the *spadix* covered all over; there is no calyx; there are five petals; the berries polyspermous. There are five species, all natives of the Indies. The

only one which makes any appearance is the *pertusum*, with leaves having holes, and a climbing stalk. This is a native of most of the West India islands. It hath trailing stalks which put out roots at every joint, that fasten to the trunks of trees, walls, or any support which is near them, and thereby rise to the height of 25 or 30 feet. The leaves are placed alternately upon long footstalks: they are four or five inches long, two and an half broad; and have several oblong holes in each, which at first sight appears as if eaten by insects, but they are natural to the leaves. The flowers are produced at the top of the stalk, which always swells to a much larger size in that part than in any other: these are covered with an oblong *spatha* or hood of a whitish green colour, which opens longitudinally on one side, and shows the pistil, which is closely covered with flowers of a pale yellow, inclining to white. This plant is easily propagated by cuttings; which if planted in pots filled with poor sandy earth, and plunged into a hot-bed, will soon put out roots; but the plants are so tender, that they must be preserved in a stove.

DRACUNCULI, in medicine, small long worms which breed in the muscular parts of the arms and legs, called *Guinea worms*. The common way of getting out these worms is by the point of a needle; and to prevent their forming there again, the usual custom is to wash the parts with wine or vinegar, with alum, nitre, or common salt, or with a strong lixivium of oak-ashes, and afterwards anointing them with an ointment of the common kind used for scorbutic eruptions, with a small mixture of quicksilver.

DRACUNCULUS, in botany. See *ARUM*.

DRAFF, a name given in some places to the wash given to hogs, and the grains given to cows.

DRAG, in building. A door is said to *drag* when in opening or shutting it hangs or grates upon the floor.

DRAG, in sea-language, is a machine consisting of a sharp, square, iron ring, encircled with a net, and commonly used to take the wheel off from the platform or bottom of the decks.

DRAGOMAN, or *DROGMAN*, a term of general use through the East for an interpreter, whose office is to facilitate commerce between the orientals and occidentals. These are kept by the ambassadors of Christian nations residing at the Porte for this purpose.

The word is formed from the Arabic *targeman* or *targiman*, of the verb *taragem*, "he has interpreted." From *dragoman* the Italians formed *dragomano*, and, with a nearer relation to its Arabic etymology, *turcismanno*; whence the French and our *trucheman*, as well as *dragoman* and *drogman*.

DRAGON, in astronomy. See *DRACO*.

DRAGON'S Head and Tail (*caput & cauda draconis*), are the nodes of the planets; or the two points where in the ecliptic is intersected by the orbits of the planets, and particularly that of the moon; making with it angles of five degrees and eighteen minutes. One of these points looks northward; the moon beginning then to have northward latitude, and the other southward, where she commences south. Thus her deviation from the ecliptic seems (according to the fancy of some) to make a figure like to that of a dragon, whose belly is where she has the greatest latitude; the inter-
section

Dracunculi
||
Dragon.

Dragon. section representing the head and tail, from which resemblance the denomination arises.

But note, that these points abide not always in one place, but have a motion of their own in the zodiac, and retrograde-wise 3 minutes 11 seconds *per* day; completing their circle in 18 years 225 days: so that the moon can be but twice in the ecliptic during her monthly period, but at all other times she will have a latitude or declination from the ecliptic.

It is about these points of intersection that all eclipses happen. They are usually denoted by these characters ♀ dragon's head, and ♂ dragon's tail.

DRAGON, in zoology. See **DRACO**.

DRAGON'S BLOOD, a gummi-resinous substance brought from the East Indies, either in oval drops wrapped up in flag leaves, or in large masses composed of smaller tears. It is said to be obtained from the palmijuncus draco, the calamus rotang, the dracena draco, the pterocarpus draco, and several other vegetables.

The writers on the materia medica in general give the preference to the former, though the others are not unfrequently of equal goodness. The fine dragon's blood of either sort breaks smooth, free from any visible impurities, of a dark red colour, which changes upon being powdered into an elegant bright crimson. Several artificial compositions, coloured with the true dragon's blood, or Brazil wood, are sometimes sold in the room of this commodity. Some of these dissolve like gums in water; others crackle in the fire without proving inflammable; whilst the genuine sanguis draconis readily melts and catches flame, and is not acted on by watery liquors. It totally dissolves in pure spirit, and tinges a large quantity of the menstruum of a deep red colour. It is likewise soluble in expressed oils, and gives them a red hue, less beautiful than that communicated by anchusa. This drug in substance has no sensible smell or taste; when dissolved, it discovers some degree of warmth and pungency. It is usually, but without foundation, looked upon as a gentle astringent; and sometimes directed as such in extemporaneous prescription against seminal gleets, the fluor albus, and other fluxes. In these cases, it is supposed to produce the general effects of resinous bodies, lightly incrassating the fluids, and somewhat strengthening the solids. But in the present practice it is very little used either externally or internally.

A solution of dragon's blood in spirit of wine is used for staining marble, to which it gives a red tinge, which penetrates more or less deeply according to the heat of the marble during the time of application. But as it spreads at the same time that it sinks deep, for fine designs the marble should be cold. Mr du Fay says, that by adding pitch to this solution the colour may be rendered deeper.

DRAGON-FISH, or **Dragonet**, in ichthyology. See **CALLIONYMUS**.

DRAGON-FLY. See **LIBELLULA**.

DRAGON-SHELL, in natural history, a name given by people curious in shells to a species of concamerated patella or limpet. This has a top very much bent; and is of an ash-colour on the outside, but of an elegant and bright flesh-colour within. This has been found sticking on the back of a tortoise, as the common limpets do on the sides of rocks; and some have been

found affixed to large shells of the pinna marina brought from the East Indies at different times.

DRAGONS, in botany. See **DRACONTIUM**.

DRAGONET, or **DRAGON-FISH**, in ichthyology. See **CALLIONYMUS**.

DRAGONNE'E, in heraldry. A lion dragonnée is where the upper half resembles a lion, the other half going off like the hinder part of a dragon. The same may be said of any other beast as well as a lion.

DRAGOON, in military affairs, a musqueteer mounted on horseback, who sometimes fights or marches on foot, as occasion requires.

Menage derives the word *dragoon* from the Latin *draconarius*, which in Vegetius is used to signify *soldier*. But it is more probably derived from the German *tragen* or *dragen*, which signifies *to carry*; as being infantry carried on horseback.

Dragoons are divided into brigades as the cavalry; and each regiment into troops; each troop having a captain, lieutenant, cornet, quarter-master, two serjeants, three corporals, and two drums. Some regiments have hautboys. They are very useful on any expedition that requires dispatch; for they can keep pace with the cavalry, and do the duty of infantry: they encamp generally on the wings of the army, or at the passes leading to the camp; and sometimes they are brought to cover the general's quarters: they march in the front and rear of the army.

The first regiment of dragoons raised in England was in 1681, and called the regiment of dragoons of North Britain. In battle or attacks they generally fight sword in hand after the first fire. Their arms are, a sword, firelock, and bayonet. In the French service, when the dragoons march on foot, their officers bear the pike and the serjeants the halbert, neither of which are used in the English service.

DRAGOONING, one of the methods used by Papists for converting refractory heretics, and bringing them within the pale of the true church.

The following method of dragooning the French Protestants, after the revocation of the edict of Nantes, under Louis XIV. is taken from a French piece, translated in 1686.

The troopers, soldiers, and dragoons went into the Protestants houses, where they marred and defaced their household stuff, broke their looking-glasses, and other utensils and ornaments, let their wine run about their cellars, and threw about their corn and spoiled it. And as to those things which they could not destroy in this manner, such as furniture of beds, linen, wearing apparel, plate, &c. they carried them to the market-place, and sold them to the Jesuits and other Roman catholics. By these means the Protestants in Montaubon alone were, in four or five days, stripped of above a million of money. But this was not the worst.

They turned the dining-rooms of gentlemen into stables for their horses: and treated the owners of the houses where they quartered with the highest indignity and cruelty, lashing them about from one to another, day and night, without intermission, not suffering them to eat or drink; and when they began to sink under the fatigue and pains they had undergone, they laid them on a bed, and when they thought them

some-

Dragons
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Dragoon-
ing.

Dragoon-
ing.

somewhat recovered, made them rise, and repeated the same tortures. When they saw the blood and sweat run down their faces and other parts of their bodies, they sluiced them with water, and putting over their heads kettle-drums, turned upside down, they made a continual din upon them till these unhappy creatures lost their senses. When one party of these tormentors were weary, they were relieved by another, who practised the same cruelties with fresh vigour.

At Negreplisse, a town near Montaubon, they hung up Isaac Favin, a Protestant citizen of that place, by his arm-pits, and tormented him a whole night, by pinching and tearing off his flesh with pinchers. They made a great fire round a boy of about 12 years old, who, with hands and eyes lifted up to heaven, cried out, "My God, help me!" And when they found the youth resolved to die rather than renounce his religion, they snatched him from the fire just as he was on the point of being burnt.

In several places the soldiers applied red-hot irons to the hands and feet of men and breasts of women. At Nantes they hung up several women and maids by their feet, and others by their arm-pits, and thus exposed them to public view stark naked. They bound to posts mothers that gave suck, and let their sucking infants lie languishing in their sight for several days and nights, crying, mourning, and gasping for life. Some they bound before a great fire, and being half roasted, let them go; a punishment worse than death. Amidst a thousand hideous cries and a thousand blasphemies, they hung up men and women by the hair, and some by their feet, on hooks in chimnies, and smoaked them with wisps of wet hay till they were suffocated. They tied some under the arms with ropes, and plunged them again and again into wells; they bound others like criminals, put them to the torture, and with a funnel filled them with wine till the fumes of it took away their reason, when they made them say, they consented to be catholics. They stripped them naked, and after a thousand indignities, stuck them with pins and needles from head to foot. They cut and slashed them with knives; and sometimes with red-hot pinchers took hold of them by the nose and other parts of the body, and dragged them about the rooms till they made them promise to be catholics, or till the cries of these miserable wretches, calling upon God for help, forced them to let them go. They beat them with staves, and thus bruised, and with broken bones, dragged them to church, where their forced presence was taken for an abjuration. In some places they tied fathers and husbands to their bed-posts, and before their eyes ravished their wives and daughters with impunity. They blew up men and women with bellows till they burst them. If any to escape these barbarities endeavoured to save themselves by flight, they pursued them into the fields and woods, where they shot at them like wild beasts, and prohibited them from departing the kingdom (a cruelty never practised by Nero or Dioclesian) upon pain of confiscation of effects, the galleys, the lash, and perpetual imprisonment; inso-much that the prisons of the sea-port towns were crammed with men, women, and children, who endeavoured to save themselves by flight from their dreadful persecution. With these scenes of desolation and

horror, the popish clergy feasted their eyes, and made them only a matter of laughter and sport.

Though my heart akes (says the writer of the piece from which we are transcribing) whilst I am relating these barbarities, yet for a perpetual memorial of the infernal cruelty practised by these monsters, I beg the reader's patience to lay before him two other instances, which, if he hath a heart like mine, he will not be able to read without watering these sheets with his tears.

"The first is of a young woman, who being brought before the council, upon refusing to abjure her religion, was ordered to prison. There they shaved her head, singed off the hair from other parts of her body; and having stripped her stark naked, led her through the streets of the city, where many a blow was given her, and stones flung at her: then they set her up to the neck in a tub full of water, where, after she had been for a while, they took her out, and put on her a shift dipt in wine, which, as it dried and stuck to her fore and bruised body, they snatched off again, and then had another ready dipped in wine to clap on her. This they repeated six times, thereby making her body exceeding raw and sore. When all these cruelties could not shake her constancy, they fastened her by her feet in a kind of gibbet, and let her hang in that posture, with her head downward, till she expired.

"The other is of a man in whose house were quartered some of these missionary dragoons. One day, having drank plentifully of his wine, and broken their glasses at every health, they filled the floor with the fragments, and by often walking over them reduced them to very small pieces. This done, in the insolence of their mirth, they resolved on a dance, and told their Protestant host that he must be one of their company; but as he would not be of their religion, he must dance quite barefoot; and thus barefoot they drove him about the room, treading on the sharp points of the broken glasses. When he was no longer able to stand, they laid him on a bed, and, in a short time, stripped him stark naked, and rolled him from one end of the room to the other, till every part of his body was full of the fragments of glass. After this they dragged him to his bed, and having sent for a surgeon, obliged him to cut out the pieces of glass with his instruments, thereby putting him to the most exquisite and horrible pains that can possibly be conceived.

"These, fellow Protestants, were the methods used by the most Christian king's apostolic dragoons to convert his heretical subjects to the Roman catholic faith! These, and many other of the like nature, were the torments to which Louis XIV. delivered them over to bring them to his own church! and as popery is unchangeably the same, these are the tortures prepared for you, if ever that religion should be permitted to become settled amongst you; the consideration of which made Luther say of it, what every man that knows any thing of Christianity must agree with him in, 'If you had no other reason to go out of the Roman church, this alone would suffice, that you see and hear, how, contrary to the law of God, they shed innocent blood. This single circumstance shall, God willing, ever separate me from the papacy. And if I was now subject to it, and could blame nothing in any of their doctrines; yet for this crime

off

Dragoon-
ing.

Drags,
Drains.

of cruelty, I would fly from her communion, as from a den of thieves and murderers."

DRAGS, in the sea-language, are whatever hangs over the ship in the sea, as shirts, coats, or the like; and boats, when towed, or whatever else that after this manner may hinder the ship's way when she sails, are called *drags*.

DRAINS, a name given, in the fen countries, to certain large cuts or ditches of 20, 30, nay sometimes 40 feet wide, carried through the marshy ground to some river or other place capable of discharging the water they carry out of the fen-lands.

An effectual method of drawing off the water from such grounds as are hurt by springs oozing out upon them (usually distinguished by the name of *wet* or *spouting* ground, or *bogs*), has been a desideratum in agriculture. Mr Anderson is almost the only person who hath treated this matter scientifically, and his observations seem to be very rational and well founded.

Essays on
Agriculture,
Vol. II.
p. 119, &c.

"Springs (says he) are formed in the bowels of the earth, by water percolating through the upper strata where that is of a porous texture, which continues to descend downwards till it meets with a stratum of clay that intercepts it in its course; where, being collected in considerable quantities, it is forced to seek a passage through the porous strata of sand, gravel, or rock, that may be above the clay, following the course of these strata till they approach the surface of the earth, or are interrupted by any obstacle which occasions the water to rise upwards, forming springs, bogs, and the other phenomena of this nature; which being variously diversified in different circumstances, produce that variety of appearances in this respect that we often meet with.

"This being the case, we may naturally conclude, that an abundant spring need never be expected in any country that is covered to a great depth with sand without any stratum of clay to force it upwards, as is the case in the sandy deserts of Arabia, and the immeasurable plains of Libya: neither are we to expect abundant springs in any soil that consists of an uniform bed of clay from the surface to a great depth; for it must always be in some porous stratum that the water flows in abundance; and it can be made to flow horizontally in that, only when it is supported by a stratum of clay, or other substance that is equally impermeable by water. Hence the *rationale* of that rule so universally established in digging for wells, that if you begin with sand or gravel, &c. you need seldom hope to find water till you come to clay; and if you begin with clay, you can hope for none in abundance till you reach to sand, gravel, or rock.

"It is necessary that the farmer should attend to this process of nature with care, as his success in draining bogs, and every species of damp and spouting ground, will in a great measure depend upon his thorough knowledge of this,—his acuteness in perceiving in every case the variations that may be occasioned by particular circumstances, and his skill in varying the plan of his operations according to these. As the variety of cases that may occur in this respect is very great, it would be a very tedious task to enumerate the whole, and describe the particular method of treating each; I shall therefore content myself with enumerating a few particular cases, to show in what manner

N^o 103.

the principles above established may be applied to practice.

Drains.

Plate
CLXV.

"Let fig. 1. represent a perpendicular section of a part of the earth, in which AB is the surface of the ground, beneath which are several strata of porous substances which allow the water to sink through them till it reaches the line CD, that is supposed to represent the upper surface of a solid bed of clay; above which lies a stratum of rock, sand, or gravel. In this case, it is plain, that when the water reaches the bed of clay, and can sink no farther, it must be there accumulated into a body; and seeking for itself a passage, it flows along the surface of the clay, among the sand or gravel, from D towards C; till at last it issues forth, at the opening A, a spring of pure water.

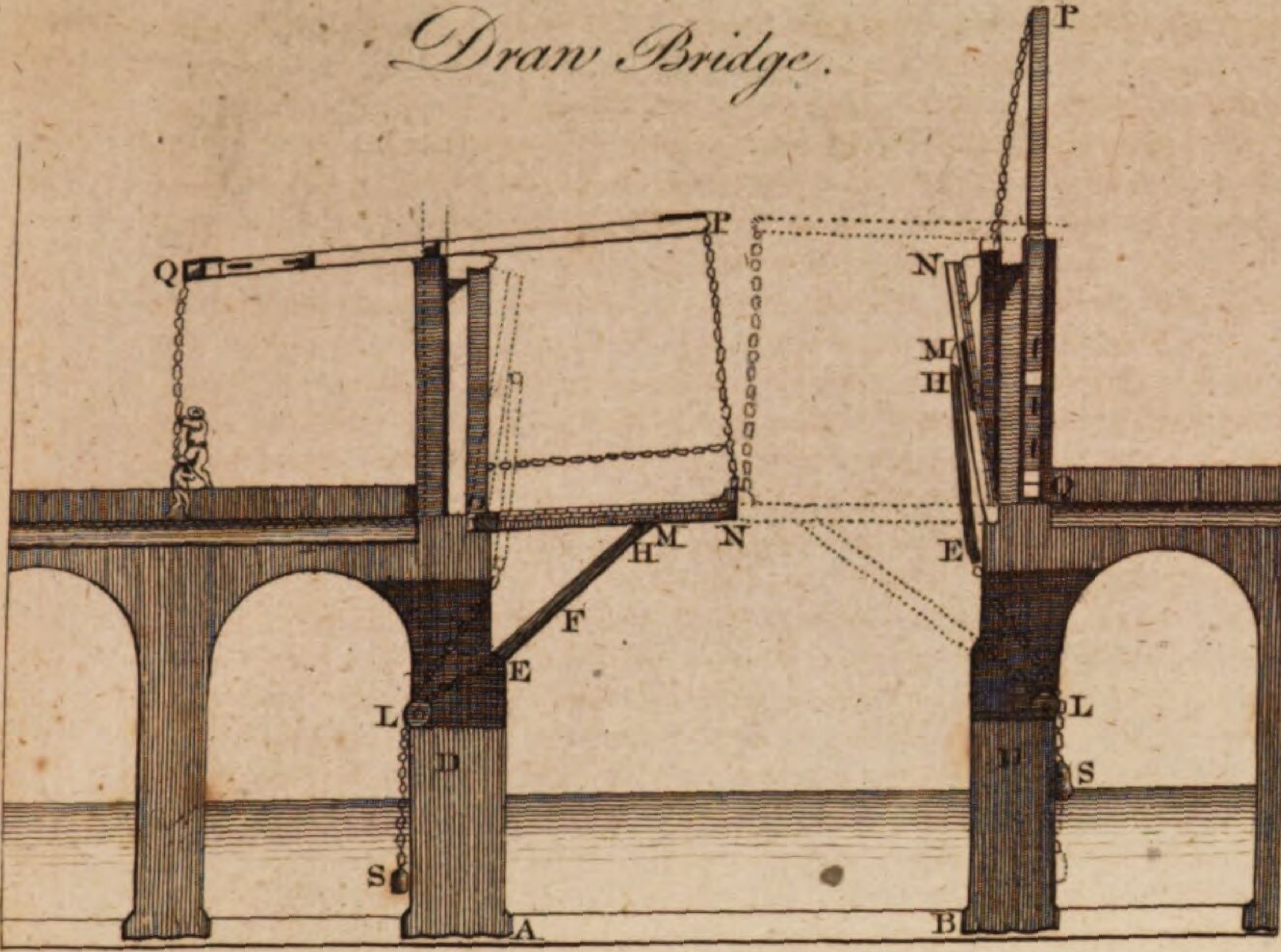
"If the quantity of water that is accumulated between D and C is not very considerable, and the stratum of clay approaches near the surface; in that case, the whole of it will issue by the opening at A, and the ground will remain dry both above and below it. But, if the quantity of water is so great as to raise it to a considerable height in the bed of sand or gravel, and if that stratum of sand is not discontinued before it reaches the surface of the ground, the water, in this case, would not only issue at A, but would likewise ooze out in small streams thro' every part of the ground between A and a; forming a barren patch of wet sandy or gravelly ground upon the side of a declivity, which every attentive observer must have frequently met with.

"To drain a piece of ground in this situation is perhaps the most unprofitable task that a farmer can engage in; not only because it is difficult to execute, but also because the soil that is gained is but of very little value. However, it is lucky that patches of this kind are seldom of great breadth, although they sometimes run along the side of a declivity in a horizontal direction for a great length. The only effectual method of draining this kind of ground, is to open a ditch as high up as the highest of the springs at a, which should be of such a depth as not only to penetrate through the whole bed of sand or gravel, but also to sink so far into the bed of clay below, as to make a canal therein sufficiently large to contain and carry off the whole of the water. Such a ditch is represented by the dotted lines *aex*: but as the expence of making a ditch of such a depth as this would suppose, and of keeping it afterwards in repair, is very great, it is but in very few cases that this mode of draining would be adviseable; and never, unless where the declivity happens to be so small, as that a great surface is lost for little depth, as would have been the case here if the surface had extended in the direction of the dotted line *ad*.

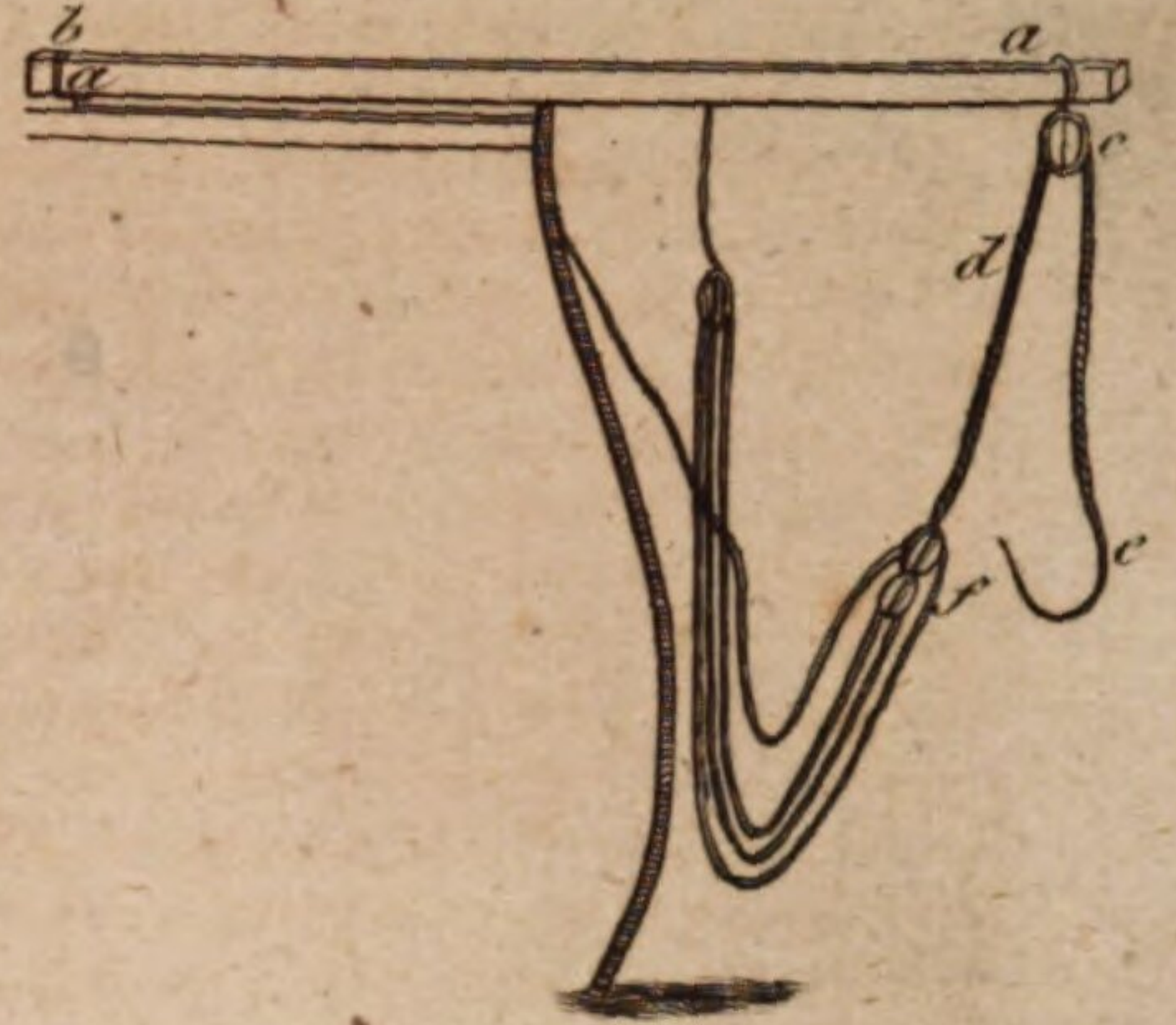
"But supposing that the stratum of clay, after approaching toward the surface at A, continued to keep at a little depth below ground; and that the soil which lay above it was of a sandy or spongy nature, so as to allow the water to penetrate it easily; even supposing the quantity of water that flowed from D to C was but very inconsiderable, instead of rising out at the spring A, it would flow forward along the surface of the clay among the porous earth that forms the soil, so as to keep it constantly drenched with water, and of consequence render it of very little value.

"Wetness

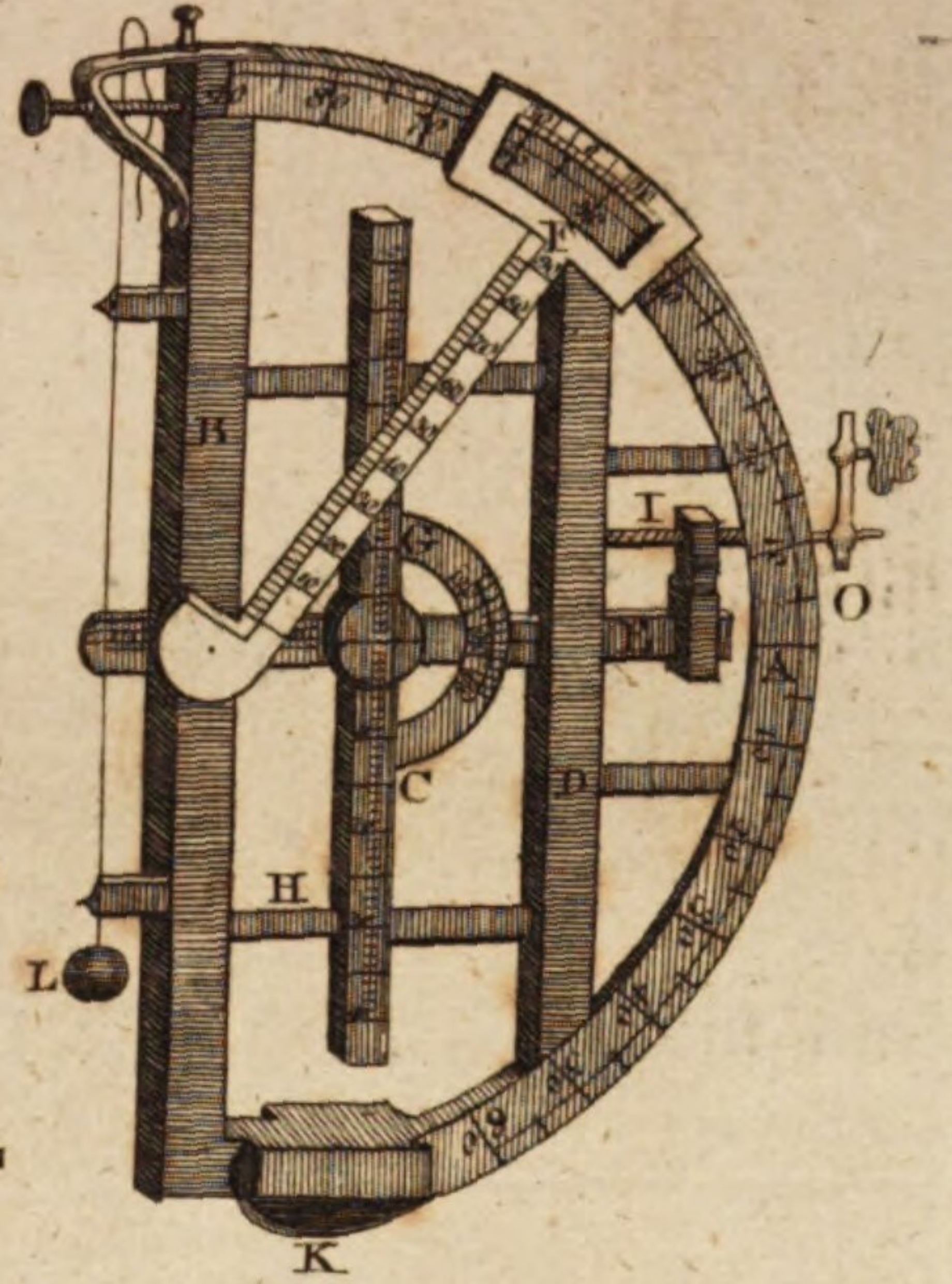
Draw Bridge.



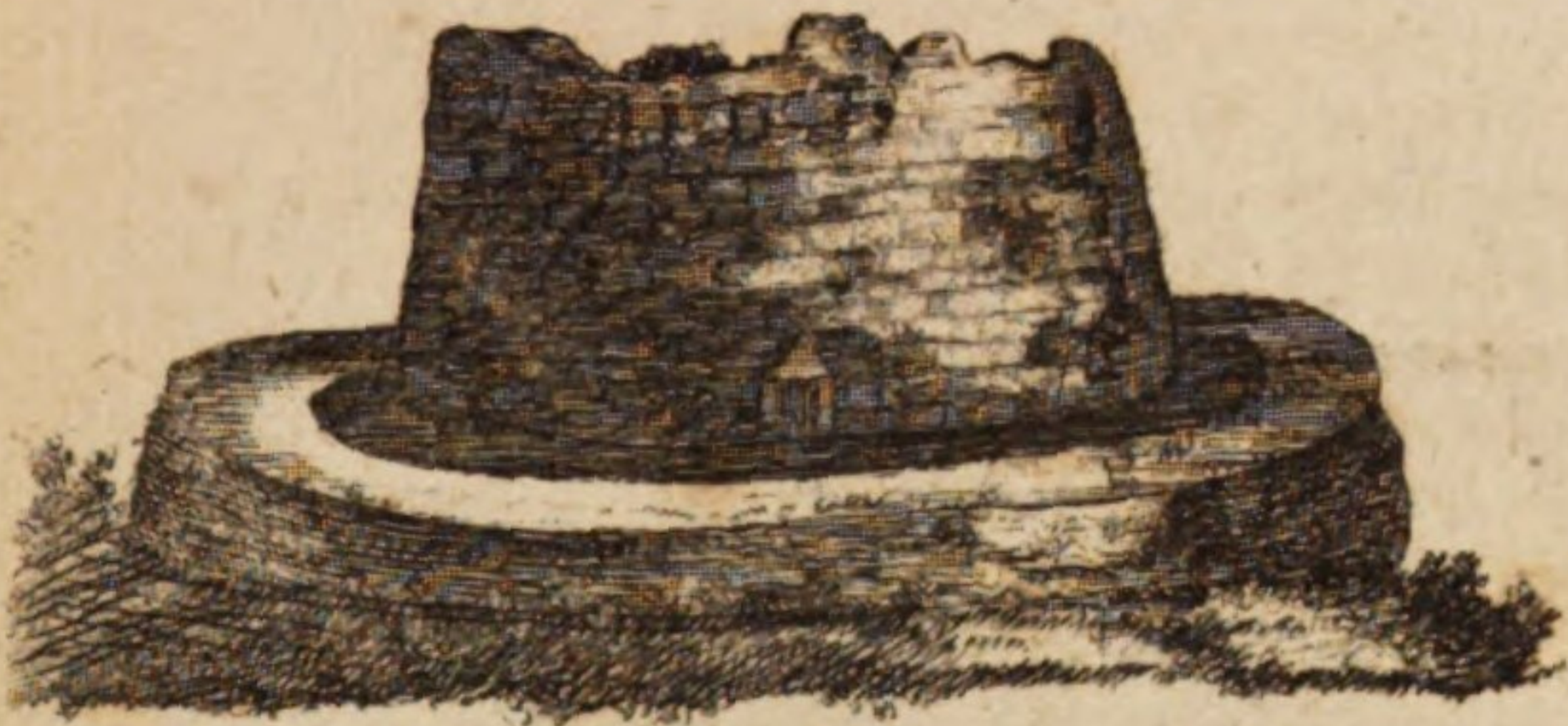
Davit.



Dendrometer, N^o 1.



A Dun or Burgh.



N^o 2.

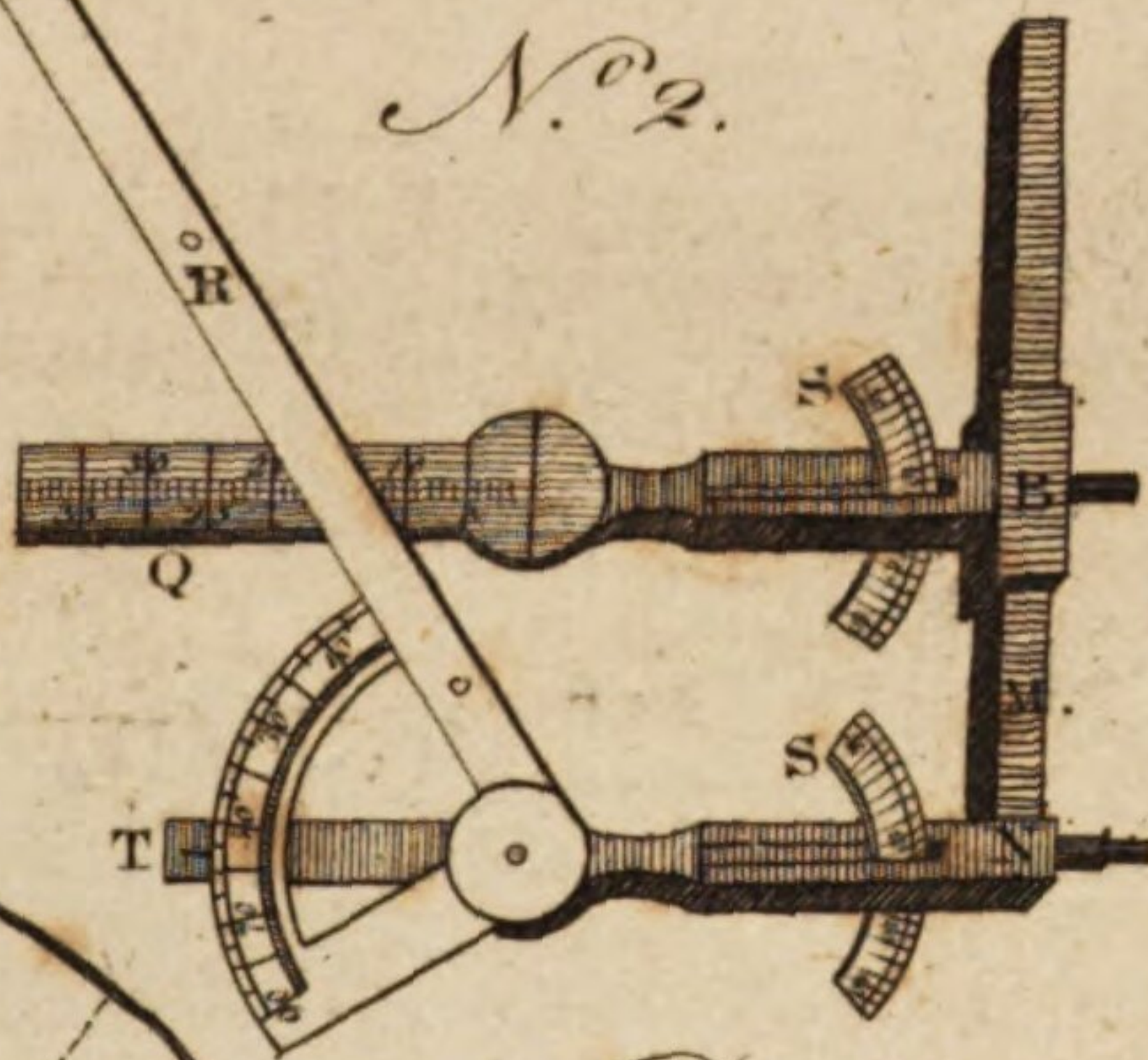
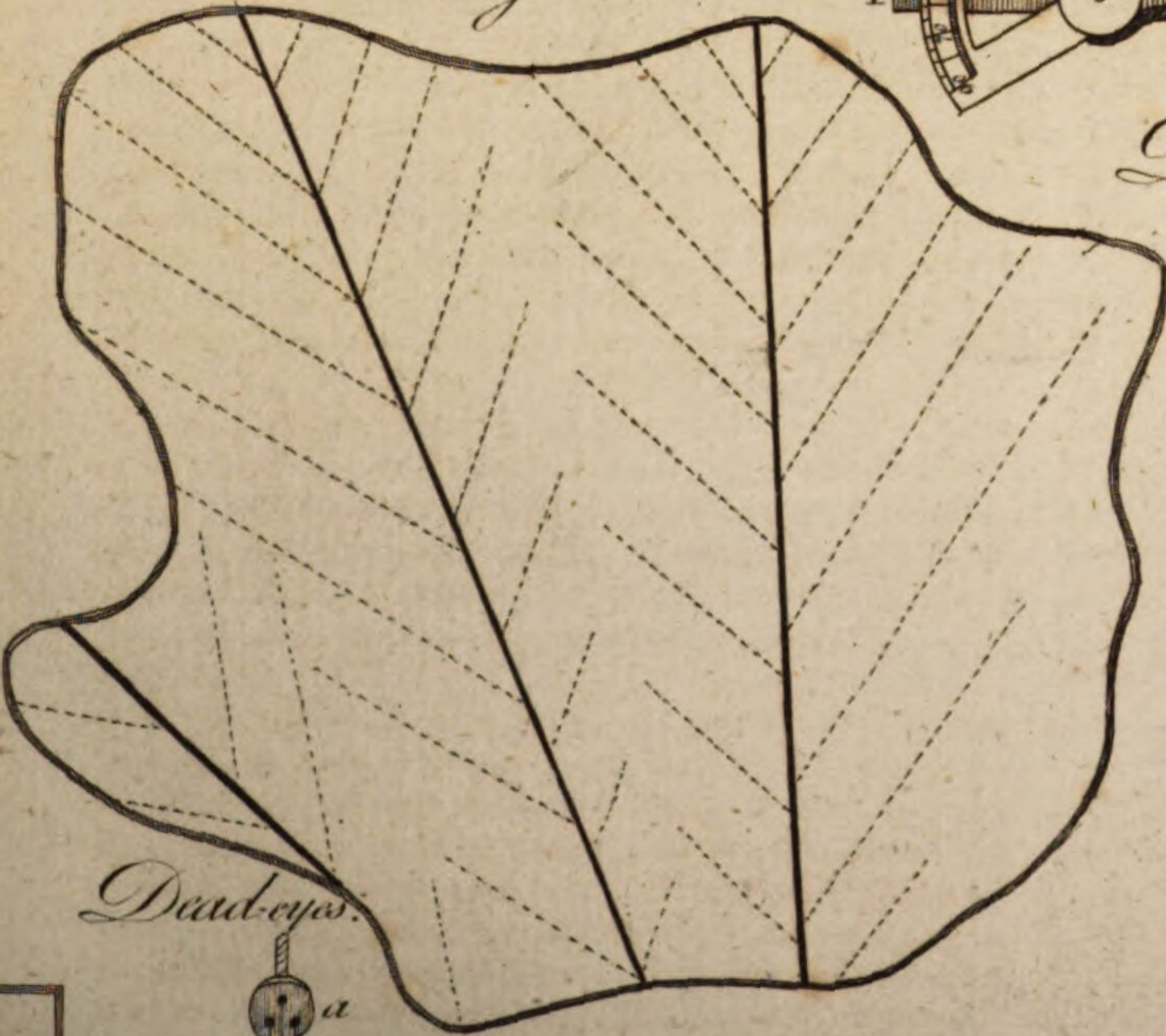


Fig. 5.



Drains.



Fig. 3.



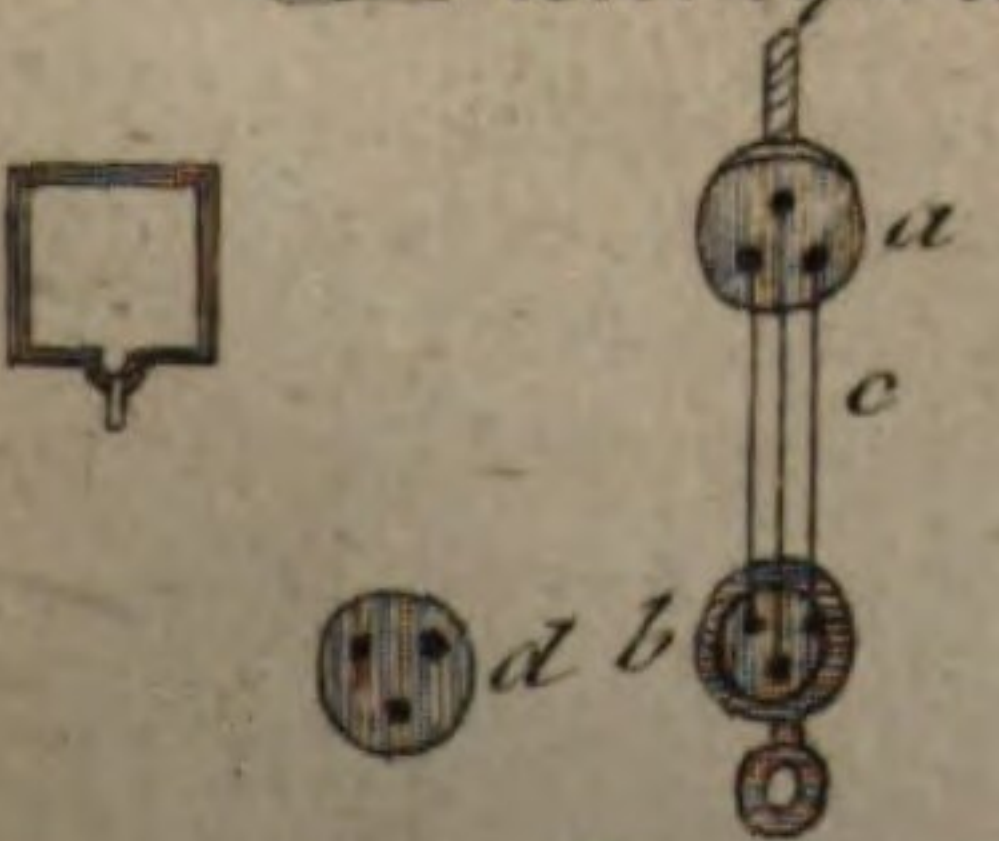
Fig. 1.



Fig. 2.



Dead-eyes.



Drains.

"Wetness arising from this cause, is usually of much greater extent than the former: and, as it admits of an easy cure, it ought not to be one moment delayed; as a ditch of a very moderate depth opened at A, and carried through a part of the stratum of clay (as represented by the dotted lines A *k f*), would intercept and carry off the whole of the water, and render the field as dry as could be desired. It is, therefore, of very great consequence to the farmer, accurately to distinguish between these two cases, so nearly allied to each other in appearance; and, as this can be easiest done by boring, every one who has much ground of this kind ought to provide himself with a set of boring-irons, which he will likewise find use for on other occasions.

"I might here enumerate a great variety of cases which might be reduced to the same head with the foregoing: but as any attentive reader may, after what has been said, be able easily to distinguish these, I shall only in general observe, that every soil of a soft and porous texture, that lies upon a bed of hard clay, whatever its situation in other respects may be, will in some measure be subjected to this disease. And if it is upon a declivity of any considerable length, the undermost parts of the field will be much damaged by it, unless ditches are thrown up across the declivity at proper distances from one another, to intercept the water in its descent.

"It may not likewise be improper here to observe, that in cases of this nature, unless where the soil is of a very great depth, the malady will always be increased, by raising the ridges to a considerable height; as will appear evident by examining fig. 2. in which the line A B represents the surface of a field of this nature, and C D the surface of the bed of clay. Now, if this field were raised into high ridges, as at F F F, so that the furrows E E E descended below the surface of the clay, it is plain, that all the water that should sink through the middle of the ridge, would run along the surface of the clay till it came to the sides of the ridge L L L L L L, which would thus be kept continually soaked with water. Whereas, if the ground had been kept level, as in the part of the field from G to H, with open furrows H, at moderate distances from each other, the water would immediately sink to the clay, and be carried off by the furrows, so as to damage the soil far less than when the ridges are high. If the soil is so thin as that the plough can always touch the clay, the ridges ought to be made narrow and quite flat, as from G to H: but if there is a little greater depth of soil, then it ought to be raised into ridges of a moderate height, as from H to B, so as to allow the bottom of the furrow to reach the clay: but neither is this necessary where the soil is of any considerable depth.

"I have seen some industrious farmers, who having ground in this situation, have been at the very great expence of making a covered drain in each furrow. But, had they rightly understood the nature of the disease, they never would have thought of applying such a remedy; as must appear evident at first sight to those who examine the figure. The success was what might be expected from such a foolish undertaking.

"These observations, it is hoped, will be sufficient as to the manner of treating wet, sandy, or porous soils.

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I now proceed to take notice of such as are of a stiff clayey nature, which are often very different in appearance, and require a different treatment from these.

"Suppose that (in fig. 3.) the stratum of sand or gravel D C should be discontinued, as at E, and that the stratum above it should be of a coherent clayey nature. In this case, the water that flowed towards E, being there pent in on every side, and being accumulated there in great quantities, it must at length force a passage for itself in some way; and pressing strongly upon the upper surface, if any one part is weaker than the rest, it there would burst forth and form a spring, (as suppose at A). But if the texture of every part of this stratum were equally strong, the water would squeeze thro' many small crannies, and would ooze out in numberless places, as between A and F, so as to occasion that kind of wetness that is known by the name of a *spouting clayey soil*.

"The cure, in this case, is much more easily effected than in any of the former; for if a ditch of a considerable size is opened, as at A, towards the lowermost side of the spouting ground, so deep as to penetrate through the upper stratum of clay, and reach to the gravel, the water will rise up through it at first with very great violence, which will gradually decrease as the pressure from the water behind is diminished; and when the whole of the water accumulated in this subterraneous reservoir is run off, there being no longer any pressure upon the clay above it, the whole soon becomes as dry as could be desired, and continues so ever afterwards, if the ditch is always kept open. This I speak from experience, I having rendered some fields of this kind that were very wet, quite dry by this method of treating them.

"It will hardly be necessary for me here to put the farmer upon his guard, to be particularly careful in his observations, that he may distinguish between the wetness that is produced from this cause, and that which proceeds from the cause before mentioned; because the treatment that would cure the one would be of no use at all to the other. The attentive observer likewise will readily perceive, that if any field that is wet from this cause admits of being ploughed, it will be in equal danger of being hurt by being raised into high ridges, with the other kind of damp ground before mentioned. For as the depth of earth above the reservoir would be smaller in the deep furrows than any where else, there would, of consequence, be less resistance to the water in that place, so that it would arise there in greater abundance. And if, in this case, a farmer should dig a drain in each furrow, as a considerable quantity of water would rise into them, in some cases, the ground might be improved, or even quite drained thereby, especially if they should have accidentally reached the gravel in any one place; although at an expence much greater than was necessary. I take notice of this circumstance in some measure to prevent the prejudice that some inattentive observers might entertain against what was said before of this method of draining, from their having accidentally seen some fields that may have been bettered by it.

"Bogs are only a variety of this last-mentioned kind of wet ground; and, therefore, ought in general to be drained after the same manner with them. Clay is a substance that strongly resists the entrance of water into

Drains.

Plate
CLXV.

Drains.

into it : but when it is long drenched with it, it is, in process of time, in some measure dissolved thereby ; loses its original firmness of texture and consistence ; and becomes a sort of semi-fluid mass, which is called a *bog* ; and as these are sometimes covered with a strong scurf of a particular kind of grass, with very matted roots, which is strong enough to bear a small weight without breaking, although it yields very much, it is in these circumstances called a *swaggle*. But, whatever be the nature of the bog, it is invariably occasioned by water being forced up through a bed of clay, as just now described, and dissolving or softening, if you will, a part thereof. I say only a part ; because whatever may be the depth of the bog or swaggle, it generally has a partition of solid clay between it and the reservoir of water under it, from whence it originally proceeds : for if this were not the case, and the quantity of water were considerable, it would meet with no sufficient resistance from the bog, and would issue through it with violence, and carry the whole semi-fluid mass along with it. But this would more inevitably be the case, if there was a crust at the bottom of the bog, and if that crust should ever be broken, especially if the quantity of water under it were very considerable : and as it is probable, that, in many cases of this sort, the water slowly dissolves more and more of this under-crust, I make no doubt, but that, in the revolution of many ages, a great many eruptions of this kind may have happened, although they may not have been deemed of importance enough to have the history of them transmitted to posterity. Of this kind, although formed of a different substance, I consider the flow of the Solway-moss in Northumberland to have been ; which, upon the 16th of November 1771, burst its former boundaries, and poured forth a prodigious stream of semi-fluid matter, which in a short time covered several hundred acres of very fine arable ground. Nor will any one, who is acquainted with the nature of moss,—who knows its resemblance to clay in its quality of absorbing and retaining water, and its very easy diffusibility therein, be surprised at this ; as, from all these properties, it is much better adapted for forming an extensive bog, and therefore in greater danger of producing an extensive devastation by an eruption of the water into it, than those that are formed of any kind of clay whatever.

Fig. 4.

If the bog, or swampy ground, is upon a declivity, the ditch ought to be carried across the field about the place where the lowest springs arise. But if the surface of the ground is level or nearly so, as between A and B, and the springs break out in several places, *qqqqqq*, so as to form soft quagmires interspersed through the whole of the field, it will be of little consequence in what part the drain is opened ; for if it is dug up so deep as to allow the water to rise in it with freedom, it will issue through that opening, and the field will be left perfectly dry.

“ But as it may frequently happen that the stratum of gravel should be at a considerable depth beneath the surface of the earth, and as it may be sometimes even below the level of the place into which the drain must be emptied, it might sometimes be extremely difficult to make a ditch so deep as to reach the bed of sand or gravel. But it is lucky for us that this is not absolutely necessary in the present case ; as a drain

of two or three feet deep, as at D, will be equally effectual with one that should go to the gravel. All that is necessary in this case, is to sink pits (P) in the course of the drain, at a moderate distance from one another, which go so deep as to reach the gravel ; for as the water there meets with no resistance, it readily flows out at these openings, and is carried off by the drain without being forced up through the earth ; so that the ground is left entirely dry ever after.

“ I have likewise drained several fields in this way ; and as I have generally found the appearances pretty much alike, I shall, for the information of the inexperienced reader, give a short account of them.

“ If you attempt to make your pit in one of these soft quaggy places where the water is found in great abundance, you will meet with very great difficulty in forming it ; for as the substance of which it is composed is soft, it will always flow into the hole as fast as you dig it ; on which account I would advise, not to attempt to make the pit in the swaggle, but as near it in the solid earth as you conveniently can. However, if it is pretty firm, and of no great extent, it is sometimes practicable to make a pit in the soft bog at the driest time of the year. This I have sometimes practised, which gave me an opportunity of observing the nature of these bogs more perfectly than I otherwise would have had. In the trials of this kind that I have made, this soft quaggy ground has seldom been above three or four feet deep, below which I have always found a stratum of hard tough clay usually mixed with stones ; and so firm, that nothing but a mattock or pick-axe could penetrate it : and as this is comparatively so much drier than the ground above it, an inexperienced operator is very apt to imagine that this is the bottom that he is in search of. In digging thro’ this stratum, you will frequently meet with small springs oozing out in all directions ; some of them that might fill the tube of a small quill, and others so small as to be scarce perceptible : but without regarding these, you must continue to dig on without intermission till you come to the main body of the reservoir, if I may so call it, that is contained in the rock, gravel, or sand ; which you will generally find from two to four feet below the bottom of the swaggle, and which you will be in no danger of mistaking when you come to it : for, if there has been no opening made before that in the field, as soon as you break the crust immediately above the gravel or rock, the water bursts forth like a torrent, and on some occasions rises like a *jet d’eau*, to a considerable height above the bottom of the ditch ; and continues to flow off with great impetuosity for some time, till the pent-up water being drained off, the violent boiling up begins to subside, and the strength of the current to abate ; and, in a short time, it flows gently out like any ordinary spring ;—allowing it to remain in this state, the quaggy earth begins to subside, and gradually becomes firmer and firmer every day ; so that, in the space of a few months, those bogs which were formerly so soft as hardly to support the weight of a small dog, become so firm, that oxen and horses may tread upon them without any danger of sinking, at the very wettest season of the year. I have had a field of this nature, that, by having only one such pit as I have now described opened in it, was entirely drained to the distance of above a hundred yards.

Drains.

Drains. yards around it in every direction. But as it is possible that the stratum in which the water runs may be in some places interrupted, it will be in general expedient to make several of these pits, if the field is of great extent; always carrying the drain forward thro' the lowermost part of the field, or as near the quag as you conveniently can; and sinking a pit wherever you may judge it will be most necessary. But if the stratum of gravel is not interrupted, there will be no violent burst of water at opening any of these after the first, as I have frequently experienced. To keep these wells from closing up after they are made, it is always expedient to fill them up with small stones immediately after they are made, which ought to rise to the height of the bottom of the drain.

"I have often imagined that the expence of digging these pits might be saved by boring a hole through this solid stratum of clay with a large wimble made on purpose; but as I never experienced this, I cannot say whether or not it would answer the desired end exactly.

"If the whole field that is to be drained consists of one extensive bog, it will require a long time before the whole work can be entirely finished, as it will be impossible to open a drain through it till one part of it is first drained and becomes solid ground. In a situation of this kind, the undertaker, after having opened a drain to convey the water from the lowest part of the bog, must approach as near to the swampy ground as he can, and there make his first pit; which will drain off the water from the nearest parts of the bog. When this has continued open for some time, and that part of the bog is become so solid as to admit of being worked, let him continue the ditch as far forward thro' it as the situation it is in will admit of, and there sink another pit; and proceed gradually forward in the same manner; making cross cuts where necessary, till the whole be finished.

"In this manner may any bog or track of spouting ground of this nature be rendered dry at a very inconsiderable expence; and as there can be no other method of draining ground of this sort effectually, I recommend the study of it to the attention of every diligent farmer who may have occasion for it. Let him first be extremely cautious in examining all the circumstances of his particular fields, that he may be certain which of the classes above enumerated it may be ranked with; and, when he is perfectly sure of that, he may proceed without fear, being morally certain of success.

"There is, however, one kind of damp ground not yet particularly specified, that I have purposely omitted taking notice of till this time, as I have never had any opportunity of examining particularly into the nature of it, nor of ascertaining by experience what is the most proper method of treating it.—The soil I have now particularly in my eye consists of a deep strong clay that does not vary its nature even on the surface, but in as far as manures may have rendered it more friable and tender: the colour usually inclines to a reddish cast, and, for the most part, it is situated upon the side of some declivity. This bed of clay reaches to a great depth, without any variation, and is intermixed with a considerable quantity of small round stones. Many soils of the sort now described, are apt to be continually

moist and full of water during the winter season; but when the dry weather of summer sets in, the moisture is diminished, and the surface becomes hard, and it is rent into many large gaps which allow free admission to the sun and air, so as to scorch up almost every plant that is sowed upon it: and as these soils are usually in themselves naturally fertile when drained, it were to be wished that some method could be discovered that would be less expensive than what is usually practised with regard to some soils of this kind in Essex; where they make covered drains of two and a half feet deep, running diagonally through the whole field, at the distance of 20 feet from each other."

Concerning the making of these drains we have the following directions in the *Georgical Essays*, by T. B. Bayley, Esq; of Hope near Manchester.—"First make the main drains down the slope or fall of the field. When the land is very wet, or has not much fall, there should, in general, be two of these to a statute acre; for the shorter the narrow drains are, the less liable they will be to accidents. The width of the trench for the main drains should be 30 inches at top, but the width at the bottom must be regulated by the nature and size of the materials intended to be used. If the drain is to be made of bricks 10 inches long, 3 inches thick, and 4 inches in breadth, then the bottom of the drain must be 12 inches; but if the common sale bricks are used, then the bottom must be proportionably contracted. In both cases there must be an interstice of one inch between the bottom brick and the sides of the trench, and the vacuity must be filled up with straw, rushes, or loose mould. For the purpose of making these drains, I order my bricks to be moulded 10 inches long, 4 broad, and 3 thick; which dimensions always make the best drain.

"The method I pursue in constructing my main drains is as follows.—When the ground is soft and spongy, the bottom of the drain is laid with bricks placed across. On these, on each side, two bricks are laid flat, one upon the other, forming a drain six inches high and four broad; which is covered with bricks laid flat. When the bottom of the trench is found to be a firm and solid body, as clay or marl, the bottom of the drain does not then require being laid with bricks. In that case the sides are formed by placing one brick edgewise, instead of two laid flat.

"This latter method is much cheaper, and in such land equally durable with the other. When stones are used instead of bricks, the bottom of the drain should be about eight inches in width. And here it will be proper to remark, that, in all cases, the bottom of the main drains must be sunk four inches below the level of the narrow ones, even at the point where the latter fall into them.

"The main drains should be kept open till the narrow ones are begun from them, after which they may be finished; but before the earth is returned upon the stones or bricks, it will be advisable to throw in straw, rushes, or brush-wood, to increase the freedom of the drain.

"The small narrow drains should be cut at the distance of 16 or 18 feet from each other; and should fall into the main drain at very acute angles, to prevent any stoppage. At the point where they fall in, and eight or ten inches above it, they should be made

Drake.
Plate
CLXV.

firm with brick or stone. These drains should be 18 inches wide at top, and 16 at bottom."—Fig. 5. represents a field with drains laid out according to Mr Bayley's method. The black lines represent the main drains, and the dotted lines represent the narrow drains communicating with the former from all parts of the field.

DRAKE, in ornithology, the male of the duck kind. See ANAS.

DRAKE (Sir Francis), the renowned English admiral, was the son of Edmund Drake a sailor, and born near Tavistock in Devonshire, in the year 1545. He was brought up at the expence and under the care of Sir John Hawkins, who was his kinsman; and, at the age of 18, was purser of a ship trading to Biscay. At 20, he made a voyage to Guinea; and, at 22, had the honour to be made captain of the *Judith*. In that capacity he was in the harbour of St John de Ulloa, in the gulph of Mexico, where he behaved most gallantly in the glorious actions under Sir John Hawkins, and returned with him to England with great reputation, though not worth a groat. Upon this he projected a design against the Spaniards in the West Indies; which he no sooner published, than he had volunteers enough ready to accompany him. In 1570, he made his first expedition with two ships; and the next year with one only, in which he returned safe, if not with such advantages as he expected. He made another expedition in 1572, wherein he did the Spaniards some mischief, and gained considerable booties. In these expeditions he was much assisted by a nation of Indians, who then were, and have been ever since, engaged in perpetual wars with the Spaniards. The prince of these people was named *Pedro*; to whom Drake presented a fine cutlass from his side, which he saw the Indian greatly admired. *Pedro*, in return, gave him four large wedges of gold; which Drake threw into the common stock, saying, That he thought it but just that such as bore the charge of so uncertain a voyage on his credit, should share the utmost advantage that voyage produced. Then, embarking his men with all the wealth he had obtained, which was very considerable, he bore away for England, where he arrived in August 1573.

His success in this expedition, joined to his honourable behaviour towards his owners, gained him a high reputation; and the use he made of his riches, a still greater. For, fitting out three stout frigates at his own expence, he sailed with them to Ireland; where, under Walter earl of Effex, the father of the famous unfortunate earl, he served as a volunteer, and did many glorious actions. After the death of his noble patron, he returned into England; where Sir Christopher Hatton introduced him to her majesty, and procured him countenance and protection at court. By this means he acquired a capacity of undertaking that grand expedition which will render his name immortal. The first thing he proposed was a voyage into the South Seas through the Straits of Magellan; which was what hitherto no Englishman had ever attempted. The project was well received at court: the queen furnished him with means; and his own fame quickly drew together a sufficient force. The fleet with which he sailed on this extraordinary undertaking, consisted only of five vessels, small when compared with modern ships,

and no more than 164 able men. He sailed on the 13th of December 1577; on the 25th fell in with the coast of Barbary, and on the 29th with cape Verd. On the 13th of March he passed the equinoctial, made the coast of Brazil on the 5th of April, and entered the River de la Plata, where he lost the company of two of his ships; but meeting them again, and taking out their provisions, he turned them adrift. On the 29th of May he entered the port of St Julian's, where he continued two months for the sake of laying in provisions: on the 20th of August he entered the Straits of Magellan, and on the 25th of September passed them, having then only his own ship. On the 25th of November he came to Machao, which he had appointed for a place of rendezvous in case his ships separated; but captain Winter, his vice admiral, having repassed the Straits, was returned to England. Thence he continued his voyage along the coasts of Chili and Peru, taking all opportunities of seizing Spanish ships, and attacking them on shore, till his men were fatigued with plunder; and then, coasting America to the height of 48 degrees, he endeavoured to find a passage that way back into our seas, but could not. However, he landed, and called the country *New Albion*, taking possession of it in the name and for the use of queen Elizabeth; and, having careened his ship, set sail from thence, on the 29th of September 1579, for the Moluccas. He is supposed to have chosen this passage round, partly to avoid being attacked by the Spaniards at a disadvantage, and partly from the lateness of the season, whence dangerous storms and hurricanes were apprehended. On the 13th of October he fell in with certain islands inhabited by the most barbarous people he had met with in all his voyage: on the 4th of November he had sight of the Moluccas; and, coming to Ternate, was extremely well received by the king thereof, who appears, from the most authentic relations of this voyage, to have been a wise and polite prince. On the 10th of December he made Celebes; where his ship unfortunately ran upon a rock, the 9th of January following; from which, beyond all expectation, and in a manner miraculously, they got off, and continued their course. On the 16th of March he arrived at Java Major; and from thence he intended to have directed his course to Malacca; but found himself obliged to alter his purpose, and to think of returning home. On the 25th of March 1580, he put this design in execution; and on the 15th of June he doubled the Cape of Good Hope, having then on board 57 men, and but three casks of water. On the 12th of July he passed the line, reached the coast of Guinea on the 16th, and there watered. On the 11th of September he made the island of Tercera; and on the 3d of November entered the harbour of Plymouth. This voyage round the world was performed in two years and about ten months. Shortly after his arrival, the queen going to Deptford, went on board his ship; where, after dinner, she conferred on him the order of knighthood, and declared her absolute approbation of all he had done. She likewise gave directions for the preservation of his ship, that it might remain a monument of his own and his country's glory. This celebrated ship, which had been contemplated many years at Deptford, at length decaying, it was broke up, and a chair, made out of the planks, was presented to the university of Oxford; upon

Drake.

Drake. on which the famous Abraham Cowley made the following verses :

" To this great ship, which round the world has run,
 " And match'd in race the chariot of the sun;
 " This Pythagorean ship (for it may claim,
 " Without presumption, so deserv'd a name,
 " By knowledge once, and transformation now)
 " In her new shape this sacred port allow.
 " Drake and his ship could not have wish'd, from fate,
 " An happier station, or more bless'd estate:
 " For, lo! a seat of endless rest is given,
 " To her in Oxford, and to him in heaven.

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In the year 1585, he sailed with a fleet to the West Indies; and took the cities of St Jago, St Domingo, Carthagena, and St Augustin. In 1587, he went to Lisbon with a fleet of 30 sail; and having intelligence of a great fleet assembled in the bay of Cadiz, which was to have made part of the armada, he with great courage entered that port, and burnt there upwards of 10,000 tons of shipping: which he afterwards merrily called *burning the king of Spain's beard*. In 1588, when the armada from Spain was approaching our coasts, Sir Francis Drake was appointed vice-admiral under Charles lord Howard of Effingham, high admiral of England, where fortune favoured him as remarkably as ever: for he made prize of a very large galleon, commanded by Don Pedro de Valdez, who was reputed the projector of this invasion. This affair happened in the following manner: On the 22d of July, Sir Francis observing a great Spanish ship floating at a distance from both fleets, sent his pinnace to summon the commander to yield. Valdez replied, with much Spanish solemnity, that they were 450 strong; that he himself was Don Pedro, and stood much upon his honour; and thereupon propounded several conditions, upon which he was willing to yield. But the vice-admiral replied, That he had no leisure to parley: but if he thought fit instantly to yield, he might; if not, he should soon find that Drake was no coward. Pedro, hearing the name of Drake, immediately yielded, and with 46 of his attendants came on board Drake's ship. This Don Pedro remained about two years Sir Francis Drake's prisoner in England; and, when he was released, paid him for his own and his captains liberties, a ransom of 3500*l*. Drake's soldiers were well recompensed with the plunder of this ship; for they found in it 55,000 ducats of gold, which was divided among them.

A little before this formidable Spanish armament put to sea, the ambassador of his Catholic majesty had the confidence to propound to queen Elizabeth, in Latin verse, the terms upon which she might hope for peace; which, with an English translation by Dr Fuller, we will insert in this place, because Drake's expedition to the West Indies makes a part of this message. The verses are these:

*Te veto ne pergas bello defendere Belgas:
 Quae Dracus eripuit nunc restituantur oportet:
 Quas pater evertit jubeo te condere cellas:
 Religio Papae fac restituantur ad unguem.*

" These to you are our commands,
 " Send no help to th' Netherlands:
 " Of the treasure took by Drake,
 " Restitution you must make:
 " And those abbeyes build anew,
 " Which your father overthrew:

" If for any peace you hope,
 " In all points restore the pope."

The queen's extempore return:

Ad Græcas, bone rex, fient mandata kalendis.

" Worthy king, know, this your will
 " At Latter-Lammas we'll fulfil.

In the year 1589, Sir Francis Drake commanded as admiral the fleet sent to restore Don Antonio king of Portugal, the command of the land-forces being given to Sir John Norris: but they were hardly got to sea, before the commanders differed, and so the attempt proved abortive. The war with Spain continuing, a more effectual expedition was undertaken by Sir John Hawkins and Sir Francis Drake, against their settlements in the West Indies, than had hitherto been made during the whole course of it: but the commanders here again not agreeing about the plan, this also did not turn out so successfully as was expected. All difficulties, before these two last expeditions, had given way to the skill and fortune of Sir Francis Drake; which probably was the reason why he did not bear these disappointments so well as he otherwise would have done. A strong sense of them is supposed to have thrown him into a melancholy, which occasioned a bloody flux; and of this he died on board his own ship, near the town of Nombre de Dios in the West Indies, on the 28th of January 1595-6. His death was lamented by the whole nation, and particularly by his countrymen; who had great reason to love him from the circumstances of his private life, as well as to esteem him in his public character. He was elected burges for the town of Boffiney, alias Tintagal, in the county of Cornwall, in the 27th parliament of queen Elizabeth; and for Plymouth in Devonshire, in the 35th of the same reign. This town had very particular obligations to him: for, in the year 1587, he undertook to bring water into it, through the want of which, till then, it had been grievously distressed; and he performed it by conducting thither a stream from springs at eight miles distance, that is to say, in a straight line: for in the manner he brought it, the course of it runs upwards of 20 miles.

DRAKENBORCH (Arnold), professor of eloquence and history at Utrecht, made himself known by several works, and particularly by his Notes on Titus Livius and Silius Italicus; his fine editions of which are highly esteemed.

DRAMA, a poem containing some certain action, and representing a true picture of human life, for the delight and improvement of mankind.

The principal species of the drama are two, comedy and tragedy. Some others there are of less note, as pastoral, satire, tragi-comedy, opera, &c. See the article POETRY.

DRAMATIC, an epithet given to pieces written for the stage. See POETRY.

DRANK, among farmers, a term used to denote wild oats, which never fail to infest worn-out lands; so that, when ploughed lands run to these weeds and thistles, the farmer knows it is high time to fallow them, or else to sow them with hay-seed, and make pasture of them.

DRAPERY, in sculpture and painting, signifies the representation of the clothing of human figures, and also hangings, tapestry, curtains, and most other things that

Drake.

||
 Drapery.

Drastic. that are not carnations or landscapes. See PAINTING, CRAYON, DRAWING, and MINIATURE.

Drawback. DRASTIC, in physic, an epithet bestowed on such medicines as are of present efficacy, and potent in operation; and is commonly applied to emetics and cathartics.

DRAVE, a large navigable river, which, taking its rise in the archbishopric of Salzburg, in Germany, runs south-east through Stiria; and continuing its course, divides Hungary from Sclavonia, and fall into the Danube at Esseck.

DRAUGHT, in medicine. See PORTION.

DRAUGHT, in trade, called also *cloff* or *clouch*, is a small allowance on weighable goods, made by the king to the importer, or by the seller to the buyer, that the weight may hold out when the goods are weighed again.

The king allows 1 lb draught for goods weighing no less than 1 Cwt. 2 lb for goods weighing between 1 and 2 Cwt. 3 lb for goods weighing between 2 and 3 Cwt. 4 lb from 3 to 10 Cwt. 7 lb from 10 to 18 Cwt. 9 lb from 18 to 30 or upwards.

DRAUGHT is also used sometimes for a bill of exchange, and commonly for an order for the payment of any sum of money due, &c. Then the person who gives the order is said to draw upon the other.

DRAUGHT, or, as it is pronounced, DRAFT, in architecture, the figure of an intended building described on paper; wherein are laid down, by scale and compass, the several divisions and partitions of the apartments, rooms, doors, passages, conveniencies, &c. in their due proportion.

It is usual, and exceedingly convenient, before a building is begun to be raised, to have draughts of the ichnography, or ground-plot of each floor or story; as also of the form and fashion of each front, with the windows, doors, ornaments, &c. in an orthography, or upright. Sometimes the several fronts, &c. are taken, and represented in the same draught, to show the effect of the whole building: this is called a *scenography*, or *perspective*.

DRAUGHT, the depth of a body of water necessary to float a ship: hence a ship is said to draw so many feet of water, when she is borne up by a column of water of that particular depth. Thus, if it requires a body of water whose depth is equal to 12 feet, to float or buoy up a ship on its surface, she is said to draw 12 feet water; and that this draught may be more readily known, the feet are marked on the stem and stern post, regularly from the keel upwards.

DRAUGHT-Hooks, are large hooks of iron, fixed on the cheeks of a cannon-carriage, two on each side, one near the trunnion hole, and the other at the train, distinguished by the name of *fore* and *hind draught-hooks*. Large guns have draught-hooks near the middle trunnion, to which are fixed the chains that serve to keep the shafts of the limbers on a march. The fore and hind hooks are used for drawing a gun backwards or forwards, by men with strong ropes, called *draught-ropes*, fixed to these hooks.

DRAUGHT-Horse, in farming, a sort of coarse-made horse, destined for the service of a cart or plough.

DRAWBACK, in commerce, certain duties, either of the customs or of the excise, allowed upon the exportation of some of our own manufactures; or upon

certain foreign merchandise, that have paid duty on *Drawback* importation.

The oaths of the merchants importing and exporting are required to obtain the drawback on foreign goods, affirming the truth of the officers certificate on the entry, and the due payment of the duties: and these may be made by the agent or husband of any corporation or company; or by the known servant of any merchant usually employed in making his entries, and paying his customs. In regard to foreign goods entered outward, if less quantity or value be fraudulently shipped out than what is expressed in the exporter's certificate, the goods therein mentioned, or their value, are forfeited, and no drawback to be allowed for the same. Foreign goods exported by certificate in order to obtain the drawback, not shipped or exported, or re-landed in Great Britain, unless in case of distress to save them from perishing, are to lose the benefit of the drawback, and are forfeited, or their value, with the vessel, horses, carriages, &c. employed in the re-landing thereof; and the persons employed in the re-landing them, or by whose privity they are re-landed, or into whose hands they shall knowingly come, are to forfeit double the amount of the drawback. Officers of the customs conniving at or assisting in any fraud relating to certificate goods, besides other penalties, are to forfeit their office, and suffer six months imprisonment without bail or mainprize; as are also masters, or persons belonging to the ships employed therein. Bonds given for the exportation of certificate-goods to Ireland must not be delivered up, nor drawback allowed for any goods, till a certificate under the hands and seals of the collector or comptroller, &c. of the customs be produced, testifying the landing.

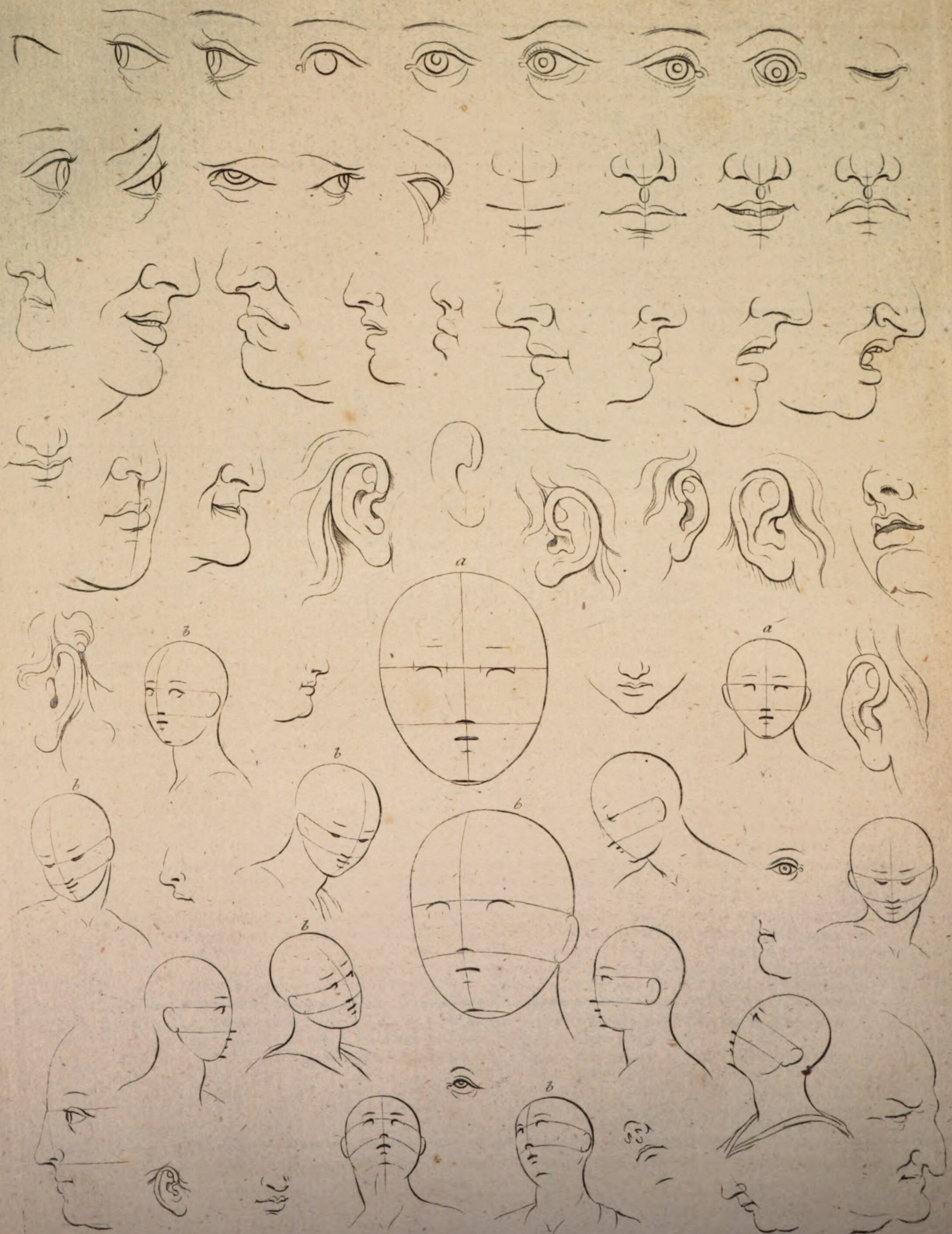
DRAW-Bridge, a bridge made after the manner of a float, to draw up or let down, as occasions serve, before the gate of a town or castle. See BRIDGE.

A draw-bridge may be made after several different ways; but the most common are made with plyers, twice the length of the gate, and a foot in diameter. The inner square is traversed with a cross, which serves for a counterpoise; and the chains which hang from the extremities of the plyers to lift up or let down the bridge, are of iron or brass.

In navigable rivers it is sometimes necessary to make the middle arch of bridges with two moveable platforms, to be raised occasionally, in order to let the masts and rigging of ships pass through. This kind of draw-bridge is represented in Plate CLXV. where A B is the width of the middle arch; A L and B L, the two piers that support the draw-bridge N O, one of the platforms of which is raised, and the other let down, having the beam P Q for its pleyer. To N O are suspended two moveable braces E H, E H; which resting on the support E, press against the bracket M, and thereby strengthen the draw-bridge. These braces are conducted to the rest by means of the weight S, pulling the chain S L F.

DRAW-Net, a kind of net for taking the larger sort of wildfowl, which ought to be made of the best sort of pack-thread, with wide meshes; they should be about two fathoms deep and six long, verged on each side with a very strong cord, and stretched at each end on long poles. It should be spread smooth and flat upon the ground; and strewed over with grass, sedge,

or





Draw-net. or the like, to hide it from the fowl; and the sportsman is to place himself in some shelter of grafs, fern, or some such thing.

DRAWING, in general, denotes the action of pulling out, or hauling along; thus we read of tooth-drawing, wire-drawing, &c. *Drawing.*

D R A W I N G,

THE art of representing the appearances of objects upon a plain surface, by means of lines, shades, and shadows, formed with certain materials adapted to the purpose.

§ 1. *Of the proper Materials for Drawing, and the Manner of using them.*

THE first thing necessary for a beginner is to furnish himself with proper materials, such as black-lead pencils, crayons of black, white, or red chalk, crow-quill pens, a rule and compasses, camels-hair pencils, and Indian ink. He must accustom himself to hold the pencil farther from the point than one does a pen in writing; which will give him a better command of it, and contribute to render the strokes more free and bold. The use of the pencil is to draw the first sketches or outlines of the piece, as any stroke or line that is amiss may in this be more easily rubbed out than in any other thing; and when he has made the sketch as correct as he can with the pencil, he may then draw carefully the best outline he has got, with his crow-quill pen and ink (A); after which he may discharge the pencil-lines, by rubbing the piece gently with the crumb of stale bread or India rubber. Having thus got the outline clear, his next work is to shade the piece properly, either by drawing fine strokes with his pen where it requires to be shaded, or by washing it with his pencil and the Indian ink. As to his rule and compasses, they are never or very rarely to be used, except in measuring the proportions of figures after he has drawn them, to prove whether they are right or not; or in houses, fortifications, and other pieces of architecture.

§ 2. *Of drawing Lines, Squares, Circles, and other regular and irregular Figures.*

HAVING got all these implements in readiness, the first practice must be to draw straight and curve lines, with ease and freedom, upwards and downwards, sideways to the right or left, or in any direction whatsoever. He must also learn to draw, by command of hand, squares, circles, ovals, and other geometrical figures: for as the alphabet, or a knowledge of the letters, is an introduction to grammar; so is geometry to drawing. The practice of drawing these simple figures till he is master of them, will enable him to imitate, with greater ease and accuracy, many things both in nature and art. And here it is proper to admonish him, never to be in a hurry; but to make himself perfectly master of one figure before he proceeds to another: the advantage, and even necessity, of this, will appear as he proceeds. Two observations more may be added: 1. That he accustom

himself to draw all his figures very large, which is the only way of acquiring a free bold manner of designing. 2. That he practise drawing till he has gained a tolerable master of his pencil, before he attempts to shadow any figure or object of any kind whatever.

§ 3. *Of Drawing Eyes, Ears, Legs, Arms, Hands, Feet, &c.*

As to the drawing of eyes and ears, legs and arms, the learner will have very little more to do than to copy carefully the examples given in Plate CLXVI. and CLXVII. taken from Sebastian le Clerc's drawing book. But the actions and postures of the hands are so many and various, that no certain rules can be given for drawing them, that will universally hold good. Yet as the hands and feet are difficult members to draw, it is very necessary, and well worth while, to bestow some time and pains about them, carefully imitating their various postures and actions, so as not only to avoid all lameness and imperfection, but also to give them life and spirit. To arrive at this, great care, study, and practice, are requisite; particularly in imitating the best prints or drawings that can be got of hands and feet (some good examples of which are given in Plate CLXVII.); for, as to the mechanical rules of drawing them by lines and measures, they are not only perplexed and difficult, but also contrary to the practice of the best masters. One general rule, however, may be given (which is universally to be observed in all subjects), and that is, Not to finish perfectly at first any single part, but to sketch out faintly, and with light strokes of the pencil, the shape and proportion of the whole hand, with the action and turn of it; and after considering carefully whether this first sketch be perfect, and altering it wherever it is amiss, you may then proceed to the bending of the joints, the knuckles, the veins, and other small particulars, which when the learner has got the whole shape and proportion of the hand or foot, will not only be more easily but also more perfectly designed.

§ 4. *Of Drawing Faces.*

THE head is usually divided into four equal parts. (1.) From the crown of the head to the top of the forehead. (2.) From the top of the forehead to the eye-brows. (3.) From the eye-brows to the bottom of the nose. (4.) From thence to the bottom of the chin. But this proportion is not constant; those features in different men being often very different as to length and shape. In a well-proportioned face, however, they are nearly right. To direct the learner therefore in forming a perfect face, his first business is to draw an oval, or rather the form of an egg; in the middle

(A) The ink made use of for this purpose must not be common, but Indian ink; which is much softer than the other, and does not run: by mixing it with water, it may be made to any degree of strength, and used in a pen like common ink.

middle of which, from the top to the bottom, draw a perpendicular line. Through the centre or middle of this line draw a diameter line, directly across from one side to the other of your oval. On these two lines all the features of your face are to be placed as follows: Divide your perpendicular line into four equal parts: the first must be allotted to the hair of the head; the second is from the top of the forehead to the top of the nose between the eye-brows; the third is from thence to the bottom of the nose; and the fourth includes the lips and chin. Your diameter line, or the breadth of the face, is always supposed to be the length of five eyes; you must therefore divide it into five equal parts, and place the eyes upon it so as to leave exactly the length of one eye betwixt them. This is to be understood only of a full front face, Plate CLXVI. fig. *a*; for if it turn to either side, then the distances are to be lessened on that side which turns from you, less or more in proportion to its turning, (fig. *b b b*.) The top of the ear is to rise parallel to the eye-brows, at the end of the diameter line; and the bottom of it must be equal to the bottom of the nose. The nostrils ought not to come out farther than the corner of the eye in any face; and the middle of the mouth must always be placed upon the perpendicular line.

§ 5. Of Drawing Human Figures.

WHEN the learner is tolerably perfect in drawing faces, heads, hands, and feet, he may next attempt to draw the human figure at length. In order to which, let him first sketch the head; then draw a perpendicular line from the bottom of the head seven times its length (for the length of the head is about one-eighth part of the length of the figure).

The best proportioned figures of the ancients are $7\frac{1}{8}$ heads in height. If, therefore, the figure stands upright, as fig. (*a*, Plate CLXVIII.) draw a perpendicular line from the top of the head to the heel, which must be divided into two equal parts. The bottom of the belly is exactly the centre. Divide the lower part into two equal parts again, the middle of which is the middle of the knee. For the upper part of the figure, the method must be varied. Take off with your compasses the length of the face (which is three parts in 4 of the length of the head); from the throat-pit to the pit of the stomach is one face, from thence to the navel is another, and from thence to the lower rim of the belly is a third. The line must be divided into seven equal parts. Against the end of the first division, place the breasts; the second comes down to the navel; the third to the privities; the fourth to the middle of the thigh; the fifth to the lower part of the knee; the sixth to the lower part of the calf; and the seventh to the bottom of the heel, the heel of the bearing leg being always exactly under the pit of the throat. But as the essence of all drawing consists in making at first a good sketch, the learner must in this particular be very careful and accurate; he ought to draw no one part perfect or exact till he see whether the whole draught be good; and when he has altered that to his mind, he may then finish one part after another as curiously as he can.

There are some who, having a statue to copy, begin with the head, which they finish, and then proceed in the same manner to the other parts of the body, finishing

ing as they go: but this method generally succeeds ill; for if they make the head in the least too big or too little, the consequence is a disproportion between all the parts, occasioned by their not having sketched the whole proportionably at first. Let the learner remember, therefore, in whatever he intends to draw, first to sketch its several parts, measuring the distances and proportions between each with his finger or pencil, without using the compasses; and then judge of them by the eye, which by degrees will be able to judge of truth and proportion, and will become his best and principal guide. And let him observe, as a general rule, Always to begin with the right side of the piece he is copying: for by that means he will always have what he has done before his eyes; and the rest will follow more naturally, and with greater ease: whereas if he begin with the left side, his hand and arm will cover what he does first, and deprive him of the sight of it; by which means he will not be able to proceed with so much ease, pleasure, or certainty.

As to the order and manner of proceeding in drawing the human body, he must first sketch the head; then the shoulders in the exact breadth; then draw the trunk of the body, beginning with the arm-pits (leaving the arms till afterwards), and so draw down to the hips on both sides; and be sure he observe the exact breadth of the waist. When he has done this, let him then draw that leg which the body stands upon, and afterwards the other which stands loose; then the arms, and last of all the hands.

He must take notice also of the bowings and bendings that are in the body; making the part which is opposite to that which bends correspond to it in bending with it. For instance: If one side of the body bend in, the other must stand out answerable to it; if the back bend in, the belly must stick out; if the knee bend out, the ham must fall in; and so of any other joint in the body. Finally, he must endeavour to form all the parts of the figure with truth, and in just proportion: not one arm or one leg bigger or less than the other; not broad Herculean shoulders, with a thin and slender waist; nor raw and bony arms, with thick and gouty legs: but let there be a kind of harmonious agreement amongst the members, and a beautiful symmetry throughout the whole figure.

Proportions and Measures of the Human Body. The centre or middle part, between the two extremes of the head and feet of a new born child, is in the navel, but that of an adult is in the os pubis; and the practice of dividing the measures of children into four, five, or six parts, whereof the head is one, is made use of by painters and sculptors.

A child of two years old has about five heads in its whole length, but one of four or five years old has near six; about the fifteenth or sixteenth year, seven heads are the proportion or measure, and the centre inclines to the upper part of the pubis. Hence it appears, as the growth of the body advances, there is a gradual approach to the proportion of an adult of near eight heads in the whole length, of which, as mentioned above, the head makes one.

Agreeable to these principles, the following Table is constructed, exhibiting the proportions of the parts of a man and of a woman, as they were fixed by the ancients, and measured by M. Audran from the Apollo









Parts

Heads

Heads 6

pollo Pythius (Plate CLXIX.) in the garden of the Vatican at Rome, and the Venus Aphroditus (Plate CLXX.) belonging to the family of the Medicis. Supposing the figures to stand upright and duly poised on both legs, the whole height of the former is divided into $31\frac{1}{2}$ parts, being 7 heads 3 parts and 6 minutes; and that of the latter into 31 parts, being 7 heads and 3 parts.

LENGTH of the HEAD and TRUNK of the BODY.

	Apollo.			Venus.		
	Hds.	Pts.	Min.	Hds.	Pts.	Min.
From the top of the head to the bottom of the chin 4 parts or	1	0	0	1	0	0
the bottom of the chin to the top of the sternum or breast-bone	0	1	7	0	1	8
the top of the sternum to the pit of the stomach	0	3	10	0	3	6
the pit of the stomach to the navel	0	2	10	0	2	7
the navel to the pubis	0	3	6	0	3	9
Length of the head and trunk of the body	3	3	9	3	3	6

LENGTH of the LOWER EXTREMITIES.

	Hds.	Pts.	Min.	Hds.	Pts.	Min.
From the pubis to the small of the thigh above the patella or knee-pan	1	2	6	1	2	3
the small of the thigh to the joint or middle of the knee	0	1	9	0	1	6
the joint of the knee to the small of the leg above the ankle	1	1	9	1	2	0
the top to the bottom of the ankle	0	1	6	0	1	0
the bottom of the ankle to the bottom of the heel	0	0	9	0	0	9
Length of the lower extremities	3	3	9	3	3	6
Length of the head and trunk, as above	3	3	9	3	3	6
Total length of the figures	7	3	6	7	3	0

LENGTH of the FORE-ARM or UPPER EXTREMITIES.

	Hds.	Pts.	Min.	Hds.	Pts.	Min.
From the top of the shoulder to the elbow	1	2	3	1	2	3
the elbow to the hand	1	1	2	1	0	6
the joint of the hand to the root of the middle finger	0	1	8	0	1	6
the root to the tip of the middle finger	0	1	10	0	1	7
Length of the upper extremities	3	2	11	3	1	10
Breadth between the outward angles of the eyes	0	1	6	0	1	7
of the face at the temples	0	2	2	0	2	2
of the upper part of the neck	0	2	0	0	1	11
over the shoulders	2	0	0	1	3	8
of the body below the arm-pits	1	2	5	1	1	8
between the nipples	1	0	7	0	3	8
from the bottom of the chin to the horizontal line of the nipples	1	0	7	1	0	1
of the body at the small of the waist	1	1	0	1	0	8
over the loins or os ilium	1	1	3	1	1	6
over the haunches or tops of the thigh-bones	1	1	5	1	2	3
of the thigh at the top	0	3	0	0	3	1
of the thigh below the middle	0	2	$8\frac{1}{2}$	0	2	7
of the thigh above the knee	0	1	8	0	2	0
of the leg below the knee	0	1	6	0	1	$10\frac{1}{2}$
at the calf of the leg	0	2	4	0	2	3
below the calf	0	1	7	0	1	$11\frac{1}{2}$
above the ankle	0	1	2	0	1	2
of the ankle	0	1	4	0	1	3
below the ankle	0	1	$1\frac{1}{2}$	0	1	1
middle of the foot	0	1	4	0	1	3
at the roots of the toes	0	1	7	0	1	7
of the arm over the biceps muscle	0	1	8	0	1	9
of the arm above the elbow	0	1	6	0	1	5
of the arm below the elbow over the long supinator	0	1	10	0	1	7
at the wrist	0	1	1	0	1	0
of the hand over the first joint of the thumb	0	1	9	0	1	8
of the hand over the roots of the fingers	0	1	7	0	1	6

Breadth over the heads of the scapulæ or shoulder blades
 Length of both arms and hands, each of the Apollos being 3h. 2p. 11m. }
 and the Venus 3h. 1p. 5m.

Breadth betwixt the tips of the middle fingers of each hand when the arms
 are stretched out horizontally }

Apollo.			Venus.		
Hds.	Pts.	Min.	Hds.	Pts.	Min.
1	2	0	1	1	4
7	1	10	6	2	10
8	3	10	8	0	2

SIDE VIEW.

Length from the top of the head to the shoulder
 from the top of the shoulder to the loins above the hip
 from the loins to the lower part of the hip
 from the hip to the side of the knee, opposite to the top of the patella
 from the side of the knee to the bottom of the heel

1	1	8	1	1	6
1	3	3	1	1	7
1	0	2	1	2	1
1	2	0	1	0	11
2	0	5	2	0	11
7	3	6	7	3	0

Length of the figures

SIDE VIEW.

Thickness from the fore to the back part of the skull
 from the wing of the nose to the tip of the ear
 of the upper part of the neck
 from the breast to the back over the nipples
 from the belly to the small of the back
 from the belly above the navel to the back of the loins
 from the bottom of the belly to the round of the hip
 from the fore-part of the thigh to the bottom of the hip
 of the thigh at the middle
 of the thigh above the knee
 at the middle of the knee below the patella
 of the leg below the knee
 of the leg at the calf
 of the leg at the ankle
 of the foot at the thickest part
 length of the foot
 from the fore-part of the bend of the foot to the lower and back part }
 of the heel
 of the arm over the biceps
 over the elbow
 below the elbow
 at the wrist
 below the joint of the wrist
 of the hand at the roots of the fingers
 at the roots of the nails

0	3	6	0	3	4
0	1	8 $\frac{1}{2}$	0	1	6
0	2	0	0	1	11
1	0	6	1	0	6
0	3	6	0	3	7
0	3	9	1	0	2
1	0	0	1	0	5
0	3	2	0	3	7
0	3	3	0	3	6 $\frac{1}{2}$
0	2	1	0	2	3
0	2	1	0	2	2
0	1	9	0	1	11
0	1	8	0	1	9
0	1	5 $\frac{1}{2}$	0	1	4
0	0	0	0	1	3
1	0	6	1	0	4 $\frac{1}{2}$
0	0	0	0	2	2
0	2	0	0	1	9
0	1	6	0	1	6
0	1	5	0	1	7
0	1	1	0	0	11
0	1	0	0	0	10
0	0	5 $\frac{1}{2}$	0	0	5
0	0	3 $\frac{1}{2}$	0	0	3

The other most admired antique statues differ a little from these proportions, the Laocoon measuring 7h. 2p. 3m. the Hercules 7h. 3p. 7m. the Pyramus 7h. 2p. the Antinous 7h. 2p. the Grecian shepherds 7h. 3p. 6m. and the Mirmillo 8h. But all their other proportions are allowed to be harmonious and agreeable to the characters of the figures they represent.

The most remarkable differences of the symmetry or proportions of a man and of a woman to be observed from the Table are: First, the shoulders of a man are broader, measuring two heads; and the haunches narrower, measuring 1h. 1p. 5m. whereas the shoulders of a woman measure only 1h. 3p. 8m. and the haunches measure 1h. 2p. 3m. The sternum or breast bone of a man is longer, measuring 3p. 8m. and the sternum of the woman only 3p. 3m. On the contrary, the pelvis of a man is less, measuring from the top to the bottom only 4 p. whereas the pelvis of

a woman measures from the top to the bottom 4p. 3m.

It is a leading principle, in which every person conversant in designing has agreed, that without a perfect knowledge of the proportions, nothing can be produced but monstrous and extravagant figures; and it is also universally admitted, that the ancient Greek and Roman sculptors attained the highest success in producing the most perfect models.

The greatest of the modern artists who have examined their figures with attention admit, that several of the ancient sculptors in some degree have excelled nature, they never having found any man so perfect in all his parts as some of their figures are. Their opportunities indeed were great; Greece abounded with beauties; and Rome being mistress of the world, every thing that was curious and beautiful was brought to it from all parts. Their motives were also powerful; religion, glory, and interest. They considered it as a kind





kind of religious worship to give the figures of their gods so much nobleness and beauty as to be able to attract the love and veneration of the people. Their own glory was also concerned, particular honours being bestowed on those who succeeded; and for their fortune they had no further care to take when they once arrived at a certain degree of merit.

Attitudes and Action of the Muscles. If a strong person is to be represented in a vigorous action, such as Hercules, &c. after a suitable proportion to such a figure and the action is designed, the parts or limbs employed in the chiefest force of the action ought to be considered. If the figure is standing, the foot must be placed in a right line, or perpendicular to the trunk or bulk of the body, where the centre of gravity may be placed in *equilibrio*. This centre is determined by the heel; or, if the figure is upon tiptoe, then the ball of the great toe is in the centre. The muscles of the leg which supports the body ought to be swelled, and their tendons drawn more to an extension than those of the other leg, which is only placed so as to receive the weight of the body towards that way to which the action inclines it. For example, suppose Hercules with a club striking at any thing before him towards the left side: Then let his right leg be placed so as to receive the whole weight of the body, and the left loosely touching the ground with its toes. Here the external muscles of the right leg ought to be expressed very strong; but those of the left scarcely appearing more than if it were in some sedentary posture, except in the present case. The foot being extended, the muscles which compose the calf of the leg are in action and appear very strong; though it is not meant that *all* the muscles of the right leg, which supports the weight of the body, ought to be expressed very strong or equally swelled, but those most tumified which are chiefly concerned in the action or posture that the leg is then in. For example, if the leg or tibia is extended, then the extending muscles placed on the thigh are most swelled: if it is bended, then the bending muscles and their tendons appear most. The like may be observed of the whole body in general when it is put into vigorous action. The Laocoon in the Vatican garden at Rome furnishes an example of this muscular appearance through the whole; but in the Antinous, Apollo, and other figures of the ancients, in the Vatican and other places, in postures where no considerable actions are designed, we see their muscles expressed but faintly, or scarcely appearing.

The clavicles or collar bones, and muscles in general, do not appear in women as in men; nor will any action in which a woman uses her utmost strength occasion such swellings or risings of the muscles to appear as they do in men, since the great quantity of fat placed under the skin of women so clothes their muscles, &c. as to prevent any such appearances.

Effects of the Exertion of the Muscles. The following are the most obvious effects of the exertion of several of the muscles; of those, to wit, which chiefly demand the attention of an artist.

If either of the mastoid muscles (Plate CLXXI. 1. 1.) act, the head is turned to the contrary side, and the muscle which performs that action appears very plain under the skin.

If the arms are lifted up, the deltoid muscles placed on the shoulders, which perform that action, swell, and make the extremities of the spines of the shoulder-blades (Plate CLXXII. 3. 3.), called the tops of the shoulders, appear indented or hollow.

The shoulder-blades following the elevation of the arms, their bases (Plate CLXXII. 4. 4.) incline at that time obliquely downward.

If the arms are drawn down, put forwards, or pulled backwards, the shoulder-blades necessarily vary their positions accordingly. All these particulars are to be learned by consulting the life only: when being well acquainted with what then appears in every action, the artist will be able to form an adequate idea how it ought to be expressed. These circumstances are little known; hence seldom attended to in designing.

When the cubit or fore-arm is bended, the biceps (Plate CLXXI. 5. 5.) has its belly very much raised, as appears in the left arm. The like may be observed of the triceps (Plate CLXXII. 6. 6.) when the arm is extended, as observed in the right arm.

The straight muscles of the abdomen (Plate CLXXI. 7. 7.) appear very strong when rising from a decumbent posture.

Those parts of the great serratus muscle (ib. 8. 8.) which are received in the teeth or beginnings of the oblique descending muscle immediately below, are very much swelled when the shoulder on the same side is brought forwards; that serratus muscle then being in action in drawing the scapula forwards.

The long extending muscles of the trunk (Plate CLXXII. 9. 9.) act alternately in walking, after this manner: If the right leg bears the weight of the body, and the left is in translation as on tiptoe, the last mentioned muscles of the back on the left side may be observed to be tumified on the other side about the region of the loins, and so on the other side.

The trochanters, or outward and uppermost heads of the thigh-bones (Plate CLXXII. 10. 10.), vary in their positions in such a manner as no precise observations can explain their several appearances; but the study after the life ought to be carefully attended to.

If the thigh is extended, as when the whole weight of the body rests on that side, the gluteus or buttock muscle (Plate CLXXII. 11. 11.) makes a very different appearance from what offers at another time; but if the thigh is drawn backwards, that muscle appears still more and more tumified.

When the whole leg is drawn upwards forwards, and at the same time the foot is inclined inwards, the upper part of the sartorius muscle (Plate CLXXI. 12. 12.) appears rising very strong; in other positions of the thigh, that muscle makes a furrowing appearance in its whole progress.

If a man is upon tiptoe, the extending muscles of the leg placed on the fore-part of the thigh (Plate CLXXI. 13. 13. 13.), and those of the foot that compose the calf of the leg (Plate CLXXII. 14. 14.), appear very strong, and the long peronæus (Plate CLXXI. 15.) makes a considerable indentation or furrowing at that time in its progress on the outside of the leg.

Many other remarks might here be offered; but a due attention to nature will soon discover them.

§ 6. *Of Light and Shade.*

AFTER the learner has made himself in some measure perfect in drawing outlines, his next endeavour must be to shade them properly. It is this which gives an appearance of substance, shape, distance, and distinction, to whatever bodies he endeavours to represent, whether animate or inanimate. The best rule for doing this is, to consider from what point, and in what direction, the light falls upon the objects which he is delineating, and to let all his lights and shades be placed according to that direction throughout the whole work. That part of the object must be lightest which hath the light most directly opposite to it; if the light falls sideways on the picture, he must make that side which is opposite to it lightest, and that side which is farthest from it darkest. If he is drawing the figure of a man, and the light be placed above the head, then the top of the head must be made lightest, the shoulders next lightest, and the lower parts darker by degrees. That part of the object, whether in naked figures, or drapery, or buildings, that stands farthest out, must be made the lightest, because it comes nearest to the light; and the light loseth so much of its brightness, by how much any part of the body bends inward, because those parts that stick out hinder the lustre and full brightness of the light from striking on those parts that fall in. Titian used to say, that he knew no better rule for the distribution of lights and shadows than his observations drawn from a bunch of grapes. Sattins and silks, and all other shining stuffs, have certain glancing reflections, exceeding bright where the light falls strongest. The like is seen in armour, brass pots, or any other glittering metal, where you see a sudden brightness in the middle or centre of the light, which discovers the shining nature of such things. Observe also, that a strong light requires a strong shade, a fainter light a fainter shade; and that an equal balance be preserved throughout the piece between the lights and shades. Those parts which must appear round require but one stroke in shading, and that sometimes but very faint; such parts as should appear steep or hollow, require two strokes across each other, or sometimes three, which is sufficient for the deepest shade. Care must be also taken to make the outlines faint and small in such parts as receive the light; but where the shades fall, the outline must be strong and bold. The learner must begin his shadings from the top, and proceed downward, and use his utmost endeavours both by practice and observation to learn how to vary the shadings properly; for in this consists a great deal of the beauty and elegance of drawing. Another thing to be observed is, that as the human sight is weakened by distances, so objects must seem more or less confused or clear according to the places they hold in the piece: Those that are very distant,—weak, faint, and confused; those that are near and on the foremost ground,—clear, strong, and accurately finished.

§ 7. *Of Drapery.*

IN the art of clothing the figures, or casting the drapery properly and elegantly upon them, many things are to be observed. 1. The eye must never be in doubt of its object; but the shape and proportion of the part or limb, which the drapery is supposed to cover, must

appear; at least so far as art and probability will permit: and this is so material a consideration, that many artists draw first the naked figure, and afterwards put the draperies upon it. 2. The drapery must not sit too close to the parts of the body: but let it seem to flow round, and as it were to embrace them; yet so as that the figure may be easy, and have a free motion. 3. The draperies which cover those parts that are exposed to great light must not be so deeply shaded as to seem to pierce them; nor should those members be crossed by folds that are too strong, lest by the too great darkness of their shades the members look as if they were broken. 4. The great folds must be drawn first, and then stroked into lesser ones: and great care must be taken that they do not cross one another improperly. 5. Folds in general should be large, and as few as possible. However, they must be greater or less according to the quantity and quality of the stuffs of which the drapery is supposed to be made. The quality of the persons is also to be considered in the drapery. If they are magistrates, their draperies ought to be large and ample; if country clowns or slaves, they ought to be coarse and short; if ladies or nymphs, light and soft. 6. Suit the garments to the body, and make them bend with it, according as it stands in or out, straight or crooked; or as it bends one way or another; and the closer the garment sits to the body, the narrower and smaller must be the folds. 7. Folds well imagined give much spirit to any kind of action; because their motion implies a motion in the acting member, which seems to draw them forcibly, and makes them more or less stirring as the action is more or less violent. 8. An artful complication of folds in a circular manner greatly helps the effect of fore-shortenings. 9. All folds consist of two shades, and no more; which you may turn with the garment at pleasure, shadowing the inner side deeper, and the outer more faintly. 10. The shades in silk and fine linen are very thick and small, requiring little folds and a light shadow. 11. Observe the motion of the air or wind, in order to draw the loose apparel all flying one way: and draw that part of the garment that adheres closest to the body before you draw the looser part that flies off from it; lest, by drawing the loose part of the garment first, you should mistake the position of the figure, and place it awry. 12. Rich ornaments, when judiciously and sparingly used, may sometimes contribute to the beauty of draperies. But such ornaments are far below the dignity of angels or heavenly figures; the grandeur of whose draperies ought rather to consist in the boldness and nobleness of the folds, than in the quality of the stuff or the glitter of ornaments. 13. Light and flying draperies are proper only to figures in great motion, or in the wind: but when in a calm place, and free from violent action, their draperies should be large and flowing; that, by their contrast and the fall of the folds, they may appear with grace and dignity. Thus much for drapery; an example or two of which are given in Plate CLXVIII. But see farther the articles CRAYON and PAINTING.

§ 8. *On the Passions.*

THE passions, says M. Le Brun, are motions of the soul, either upon her pursuing what she judges to be for her good, or shunning what she thinks hurtful to her.

her; and commonly, whatever causes emotion of passion in the soul, creates also some action in the body. It is therefore necessary for a painter to know which are the different actions in the body that express the several passions of the soul, and how to delineate them.

M. Le Brun has been extremely happy in expressing many of the passions, and the learner cannot study any thing better than the examples which he has left us of them. However, as M. De Piles justly observes, it is absurd as well as impossible to pretend to give such particular demonstrations of them as to fix their expression to certain strokes, which the painter should be obliged to make use of as essential and invariable rules. This, says he, would be depriving the art of that excellent variety of expression which has no other principle than diversity of imagination, the number of which is infinite. The same passion may be finely expressed several ways, each yielding more or less pleasure in proportion to the painter's understanding and the spectator's discernment.

Though every part of the face contributes towards expressing the sentiments of the heart, yet the eye-brow, according to M. Le Brun, is the principal seat of expression, and where the passions best make themselves known. It is certain, says he, that the pupil of the eye, by its fire and motion, very well shows the agitation of the soul, but then it does not express the kind or nature of such an agitation; whereas the motion of the eye-brow differs according as the passions change their nature. To express a simple passion, the motion is simple; to express a mixed passion, the motion is compound: if the passion be gentle, the motion is gentle; and if it be violent, the motion is so too. We may observe farther, says he, that there are two kinds of elevation in the eye-brows. One, in which the eye-brows rise up in the middle; this elevation expresses agreeable sensations, and it is to be observed that then the mouth rises at the corners: Another, in which the eye-brows rise up at the ends, and fall in the middle; this motion denotes bodily pain, and then the mouth falls at the corners. In laughter, all the parts agree; for the eye-brows, which fall toward the middle of the forehead, make the nose, the mouth, and the eyes, follow the same motion. In weeping, the motions are compound and contrary; for the eye-brows fall toward the nose and over the eyes, and the mouth rises that way. It is to be observed also, that the mouth is the part of the face which more particularly expresses the emotions of the heart: for when the heart complains, the mouth falls at the corners; when it is at ease, the corners of the mouth are elevated; and when it has an aversion, the mouth shoots forward, and rises in the middle.

"The head (says M. De Piles) contributes more to the expression of the passions than all the other parts of the body put together. Those separately can only show some few passions, but the head expresses them all. Some, however, are more peculiarly expressed by it than others: as humility, by hanging it down; arrogance, by lifting it up; languishment, by inclining it on one side; and obstinacy, when with a stiff and resolute air it stands upright, fixed, and stiff between the two shoulders. The head also best shows our supplications, threats, mildness, pride,

love, hatred, joy, and grief. The whole face, and every feature, contributes something: especially the eyes; which, as Cicero says, are the windows of the soul. The passions they more particularly discover are, pleasure, languishing, scorn, severity, mildness, admiration, and anger; to which one might add joy and grief, if they did not proceed more particularly from the eye-brows and mouth; but when those two passions fall in also with the language of the eyes, the harmony will be wonderful. But though the passions of the soul are most visible in the lines and features of the face, they often require the assistance also of the other parts of the body. Without the hands, for instance, all action is weak and imperfect; their motions, which are almost infinite, create numberless expressions: it is by them that we *desire, hope, promise, call, send back*; they are the instruments of *threatening, prayer, horror, and praise*; by them we *approve, condemn, refuse, admit, fear, ask*; express our joy and grief, our doubts, regrets, pain, and admiration. In a word, it may be said, as they are the language of the dumb, that they contribute not a little to speak a language common to all nations, which is the language of painting. But to say how these parts must be disposed for expressing the various passions, is impossible, nor can any exact rules be given for it, both because the task would be infinite, and because every one must be guided in this by his own genius and the particular turn of his own studies." See the article PASSIONS, and the Plate there referred to.

§ 9. Of drawing Flowers, Fruits, Birds, Beasts, &c.

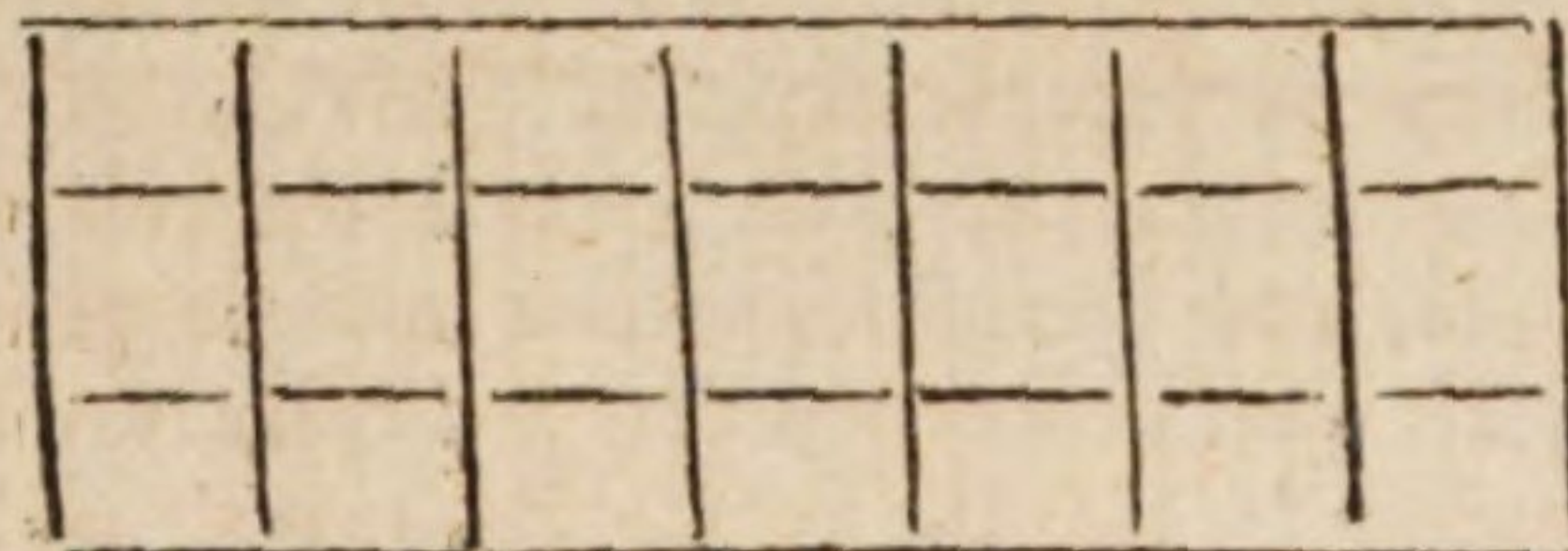
THE learner may proceed now to make some attempts at drawing flowers, fruits, birds, beasts, and the like; not only as it will be a more pleasing employment, but as it is an easier task, than the drawing of hands and feet, and other parts of the human body, which require not only more care, but greater exactness and nicer judgment. Very few rules or instructions are requisite upon this head; the best thing the learner can do is, to furnish himself with good prints or drawings by way of examples, and with great care and exactness to copy them. If it is the figure of a beast, begin with the forehead, and draw the nose, the upper and under jaw, and stop at the throat. Then go to the top of the head, and form the ears, neck, back, and continue the line till you have given the full shape of the buttock. Then form the breast, and mark out the legs and feet, and all the smaller parts. And, last of all, finish it with the proper shadows. It is not amiss, by way of ornament, to give a small sketch of landscape; and let it be suitable and natural to the place or country of the beast you draw. Much the same may be said with regard to birds. Of these, as well as beasts and other objects, the learner will find many examples among the plates given in this work.

§ 10. Of drawing Landscapes, Buildings, &c.

OF all the parts of drawing, this is the most useful and necessary, as it is what every man may have occasion for at one time or another. To be able, on the spot, to take the sketch of a fine building, or a beautiful prospect; of any curious production of art, or

uncommon appearance in nature; is not only a very desirable accomplishment, but a very agreeable amusement. Rocks, mountains, fields, woods, rivers, cataracts, cities, towns, castles, houses, fortifications, ruins, or whatsoever else may present itself to view on our journeys or travels in our own or foreign countries, may be thus brought home, and preserved for our future use either in business or conversation. On this part, therefore, more than ordinary pains should be bestowed.

All drawing consists in nicely measuring the distances of each part of the piece by the eye. In order to facilitate this, let the learner imagine in his own mind, that the piece he copies is divided into squares. For example: Suppose or imagine a perpendicular and a horizontal line crossing each other in the centre of the picture you are drawing from; then suppose also two such lines crossing your own copy. Observe in the original, what parts of the design those lines intersect, and let them fall on the same parts of the supposed lines in the copy: We say, the supposed lines; because though engravers, and others who copy with great exactness, divide both the copy and original into many squares, as below: yet this is a method not to be re-



commended, as it will be apt to deceive the learner, who will fancy himself a tolerable proficient, till he comes to draw after nature, where these helps are not to be had, when he will find himself miserably defective and utterly at a loss.

If he is to draw a landscape from nature, let him take his station on a rising ground, where he will have a large horizon; and mark his tablet into three divisions, downwards from the top to the bottom; and

divide in his own mind the landscape he is to take, into three divisions also. Then let him turn his face directly opposite to the midst of the horizon, keeping his body fixed, and draw what is directly before his eyes upon the middle division of the tablet; then turn his head, but not his body, to the left hand, and delineate what he views there, joining it properly to what he had done before; and, lastly, do the same by what is to be seen upon his right hand, laying down every thing exactly both with respect to distance and proportion. One example is given on plate CLXVIII.

The best artists of late, in drawing their landscapes, make them shoot away one part lower than another. Those who make their landscapes mount up higher and higher, as if they stood at the bottom of a hill to take the prospect, commit a great error: the best way is to get upon a rising ground, make the nearest objects in the piece the highest, and those that are farther off to shoot away lower and lower till they come almost level with the line of the horizon, lessening every thing proportionably to its distance, and observing also to make the objects fainter and less distinct the farther they are removed from the eye. He must make all his lights and shades fall one way, and let every thing have its proper motion: as trees shaken by the wind, the small boughs bending more, and the large ones less: water agitated by the wind, and dashing against ships or boats; or falling from a precipice upon rocks and stones, and spirting up again into the air, and sprinkling all about: clouds also in the air, now gathered with the winds; now violently condensed into hail, rain, and the like: Always remembering, that whatever motions are caused by the wind must be made all to move the same way, because the wind can blow but one way at once.

Finally, it must be observed, that in order to attain any considerable proficiency in drawing, a knowledge of PERSPECTIVE is absolutely necessary; see that article.

D R A

Dray, **Drayton.** DRAY, a kind of cart used by brewers for carrying barrels of beer or ale; also a sledge drawn without wheels.

DRAY, among sportsmen, denotes squirrel nests built in the tops of trees.

DRAYTON (Michael), an eminent English poet, born of an ancient family in Warwickshire in 1563. His propensity to poetry was extremely strong, even from his infancy; and we find the most of his principal poems published, and himself highly distinguished as a poet, by the time he was about 30 years of age.—It appears from his poem of Moses's Birth and Miracles, that he was a spectator at Dover of the famous Spanish armada, and it is not improbable that he was engaged in some military employment there. It is certain, that not only for his merit as a writer, but his valuable qualities as a man, he was held in high estimation, and strongly patronized by several personages of consequence; particularly by Sir Henry Goodere, Sir Walter Aston, and the Countess of Bedford; to the first of whom he owns himself indebted for great part of his education, and by the second he was for many years supported.

D R E

His poems are very numerous; and so elegant, that his manner has been copied by many modern writers of eminence since. Among these the most celebrated one is the Poly-Albion, a chorographical description of England, with its commodities, antiquities, and curiosities, in metre of 12 syllables; which he dedicated to Prince Henry, by whose encouragement it was written: and whatever may be thought of the poetry, his descriptions are allowed to be exact. He was styled *poet laureat* in his time: which, as Ben Johnson was then in that office, is to be understood in a loose sense of approbation as an excellent poet; and was bestowed on others as well as Drayton, without being confined strictly to the office known by that appellation. He died in 1631; and was buried in Westminster-abbey among the poets, where his bust is to be seen, with an epitaph penned by Ben Johnson.

DREAMS, are all those thoughts which people feel passing through their minds, and those imaginary transactions in which they often fancy themselves engaged, when in the state of sleep.

Scarce any part of nature is less open to our observation than the human mind in this state. The dreamer

Drayton,
Dreams.

Dreams. dreamer himself cannot well observe the manner in which dreams arise or disappear to him. When he awakes, he cannot recollect the circumstances of his dreams with sufficient accuracy. Were we to watch over him with the most vigilant attention, we could not perceive with certainty what emotions are excited in his mind, or what thoughts pass through it, during his sleep. But though we could ascertain these phenomena, many other difficulties would still remain. What parts of a human being are active, what dormant, when he dreams? Why does not he always dream while asleep? Or why dreams he at all? Do any circumstances in our constitution, situation, and peculiar character, determine the nature of our dreams?

We may lay before our readers such facts as have been ascertained concerning dreaming, and the most plausible conjectures that have been offered to explain those particulars, about which we can only conjecture, or have at least hitherto obtained nothing more certain than conjecture.

1. In dreaming, we are not conscious of being asleep. This is well known from a thousand circumstances. When awake, we often recollect our dreams; and we remember on such occasions, that while those dreams were passing through our minds, it never occurred to us that we were separated by sleep from the active world. We are often observed to act and talk in dreaming as if we were busily engaged in the intercourse of social life.

2. In dreaming, we do not consider ourselves as witnessing or bearing a part in a fictitious scene: we seem not to be in a similar situation with the actors in a dramatic performance, or the spectators before whom they exhibit, but engaged in the business of real life. All the varieties of thought that pass through our minds when awake may also occur in dreams; all the images which imagination presents in the former state, she is also able to call up in the latter; all the same emotions may be excited, and we are often actuated by equal violence of passion; none of the transactions in which we are capable of engaging while awake is impossible in dreams: in short, our range of action and observation is equally wide in the one state as in the other; and while dreaming, we are not sensible of any distinction between our dreams and the events and transactions in which we are actually concerned in our intercourse with the world.

3. It is said, that all men are not liable to dream. Dr Beattie, in a very pleasing essay on this subject, relates, that he knew a gentleman who never dreamed except when his health was in a disordered state: and Locke mentions somewhere, that a certain person of his acquaintance was a stranger to dreaming till the 26th year of his age; and then began to dream in consequence of having a fever. These instances, however, are too few, and we have not been able to obtain more; and, besides, it does not appear that those persons had always attended, with the care of a philosopher making an experiment, to the circumstances of their sleep. They might dream, but not recollect their dreams on awaking; and they might both dream and recollect their dreams immediately upon awaking, yet afterwards suffer the remembrance of them to slip out of the memory. We do not advance this therefore as

a certain fact concerning dreaming; we are rather inclined to think it a mistake.

But though it appears to be by no means certain that any of the human race are through the whole of life absolute strangers to dreaming; yet it is well known that all men are not equally liable to dream. The same person dreams more or less at different times; and as one person may be more exposed than another to those circumstances which promote this exercise of fancy, one person may therefore dream more than another. The same diversity will naturally take place in this as in other accidents to which mankind are in general liable.

4. Though in dreams imagination appears to be free from all restraint, and indulges in the most wanton freaks; yet it is generally agreed, that the imaginary transactions of the dreamer bear always some relation to his particular character in the world, his habits of action, and the circumstances of his life. The lover, we are told, dreams of his mistress; the miser of his money; the philosopher renews his researches in sleep often with the same pain and fatigue as when awake; and even the merchant, at times, returns to balance his books, and compute the profits of an adventure, when slumbering on his pillow. And not only do the more general circumstances of a person's life influence his dreams; his passions and habits are nearly the same when asleep as when awake. A person whose habits of life are virtuous, does not in his dreams plunge into a series of crimes; nor are the vicious reformed when they pass into this imaginary world. The choleric man finds himself offended by slight provocations as well in his dreams as in his ordinary intercourse with the world, and a mild temper continues pacific in sleep.

5. The character of a person's dreams is influenced by his circumstances when awake in a still more unaccountable manner. Certain dreams usually arise in the mind after a person has been in certain situations. Dr Beattie relates, that he once, after riding 30 miles in a high wind, passed a part of the succeeding night in dreams beyond description terrible. The state of a person's health, and the manner in which the vital functions are carried on, have a considerable influence in determining the character of dreams. After too full a meal, or after eating of an unusual sort of food, a person has always dreams of a certain nature.

6. In dreaming, the mind for the most part carries on no intercourse through the senses with surrounding objects. Touch a person gently who is asleep, he feels not the impression. You may awake him by a smart blow; but when the stroke is not sufficiently violent to awake him, he remains insensible of it. We speak softly beside a person asleep without fearing that he overhear us. His eye-lids are shut; and even though light should fall upon the eye-ball, yet still his powers of vision are not awakened to active exertion, unless the light be so strong as to rouse him from sleep. He is insensible both to sweet and to disagreeable smells. It is not easy to try whether his organs of taste retain their activity, without awakening him; yet from analogy it may be presumed that these too are inactive. With respect to the circumstances here enumerated,

Dreams. it is indifferent whether a person be dreaming or buried in deep sleep.

Yet there is one remarkable fact concerning dreaming which may seem to contradict what has been here asserted. In dreams, we are liable not only to speak aloud in consequence of the suggestions of imagination, but even to get up, and walk about and engage in little enterprises, without awaking. Now, as we are in this instance so active, it seems that we cannot be then insensible of the presence of surrounding objects. The sleep-walker is really sensible in a certain degree of the presence of the objects around him; but he does not attend to them with all their circumstances, nor do they excite in him the same emotions as if he were awake. He feels no terror on the brink of a precipice; and in consequence of being free from fear, he is also without danger in such a situation unless suddenly awaked. This is one of the most inexplicable phenomena of dreaming.

There is also another fact not quite consonant with what has been above advanced. It is said, that in sleep a person will continue to hear the noise of a cataract in the neighbourhood, or regular strokes with a hammer, or any similar sound sufficiently loud, and continued uninterruptedly from before the time of his falling asleep. We know not whether he awakes on the sudden cessation of the noise. This fact is asserted on sufficient evidence: it is curious. Even when awake, if very deeply intent on any piece of study, or closely occupied in business, the sound of a clock striking in the neighbourhood, or the beating of a drum, will escape us unnoticed: and it is therefore the more surprising that we should thus continue sensible to sounds when asleep.

7. Not only do a person's general character, habits of life, and state of health, influence his dreams; but those concerns in which he has been most deeply interested during the preceding day, and the views which have arisen most frequently to his imagination, very often afford the subjects of his dreams. When I look forward with anxious expectation towards any future event, I am likely to dream either of the disappointment or the gratification of my wishes. Have I been engaged through the day, either in business or amusements which I have found exceedingly agreeable, or in a way in which I have been extremely unhappy? either my happiness or my misery is likely to be renewed in my dreams.

8. Though dreams have been regarded among almost all nations through the world, at least in some periods of their history, as prophetic of future events; yet it does not appear that this popular opinion has been established on good grounds. Christianity, indeed, teaches us to believe, that the Supreme Being may, and actually does, operate on our minds, and influence at times the determinations of our will, without making us sensible of the restraint to which we are thus subjected. And, in the same manner, no doubt, the suggestions which arise to us in dreams may be produced. The imaginary transactions in which we are then engaged, may be such as are actually to occupy us in life; the strange and seemingly incoherent appearances which are then presented to the mind's eye, may allude to some events which are to befall ourselves or others. It is, therefore, by no means impossible, or

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inconsistent with the general analogy of nature, that dreams should have a respect to futurity. We have no reason to regard the dreams which are related in the Holy Scriptures to have been prophetic of future events, as not inspired by heaven, or to laugh at the idea of a prophetic dream as absurd or ridiculous.

Yet it would be too much to allow to dreams all that importance which has been ascribed to them by the priesthood among heathen nations, or by the vulgar among ourselves. We know how easily ignorance imposes on itself, and what arts imposture adopts to impose upon others. We cannot trace any certain connection between our dreams and those events to which the simplicity of the vulgar pretends that they refer. And we cannot, therefore, if disposed to confine our belief to certain or probable truths, join with the vulgar in believing them really referable to futurity.

9. It appears that the brutes are also capable of dreaming. The dog is often observed to start suddenly up in his sleep, in a manner which cannot be accounted for any other way than by supposing that he is roused by some impulse received in a dream. The same thing is observable of others of the inferior animals. That they should dream, is not an idea inconsistent with what we know of their economy and manners in general. We may, therefore, consider it as a pretty certain truth, that many, if not all, of the lower species are liable to dream as well as human beings.

It appears, then, that in dreaming we are not conscious of being asleep: that to a person dreaming, his dreams seem realities: that though it be uncertain whether mankind are all liable to dreams, yet it is well known that they are not all *equally* liable to dream: that the nature of a person's dreams depends in some measure on his habits of action, and on the circumstances of his life: that the state of the health too, and the manner in which the vital functions are carried on, have a powerful influence in determining the character of a person's dreams: that in sleep and in dreaming, the senses are either absolutely inactive, or nearly so: that such concerns as we have been very deeply interested in during the preceding day, are very likely to return upon our minds in dreams in the hours of rest: that dreams may be rendered prophetic of future events; and therefore, wherever we have such evidence of their having been prophetic as we would accept on any other occasion, we cannot reasonably reject the fact on account of its absurdity; but that they do not appear to have been actually such, in those instances in which the superstition of nations, ignorant of true religion, has represented them as referring to futurity, nor in those instances in which they are viewed in the same light by the vulgar among ourselves: and, lastly, that dreaming is not a phenomenon peculiar to human nature, but common to mankind with the brutes.

We know of no other facts that have been fully ascertained concerning *dreaming*. But we are by no means sufficiently acquainted with this important phenomenon in the history of mind. We cannot tell by what laws of our constitution we are thus liable to be so frequently engaged in imaginary transactions, nor what are the particular means by which the delusion is accomplished. The delusion is indeed remarkably strong. One will sometimes have a book presented to him in a dream, and fancy that he reads, and actually enter

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enter into the nature of the imaginary composition before him, and even remember, after he awakes, what he knows, that he only fancied himself reading (A). Can this be delusion? If delusion, how or for what purposes is it produced? The mind, it would appear, does not, in sleep, become inactive like the body; or at least is not always inactive while we are asleep. When we do not dream, the mind must either be inactive, or the connection between the mind and the body must be considered as in some manner suspended: and when we dream, the mind, though it probably acts in concert with the body, yet does not act in the same manner as when we are awake. It seems to be clouded or bewildered, in consequence of being deprived for a time of the service of the senses. Imagination becomes more active and more capricious: and all the other powers, especially judgment and memory, become disordered and irregular in their operation.

Various theories have been proposed to explain what appears here most inexplicable. The ingenious Mr Baxter, in his Treatise on the Immateriality of the Human Soul, endeavours to prove that dreams are produced by the agency of some spiritual beings, who either amuse or employ themselves seriously in engaging mankind in all those imaginary transactions with which they are employed in dreaming. This theory, however, is far from being plausible. It leads us entirely beyond the limits of our knowledge. It requires us to believe without evidence. It is unsupported by any analogy. It creates difficulties still more inexplicable than those which it has been proposed to remove. Till it appear that our dreams cannot possibly be produced without the interference of other spiritual agents, possessing such influence over our minds as to deceive us with fancied joys, and involve us in imaginary afflictions, we cannot reasonably refer them to such a cause. Besides, from the facts which have been stated as well known concerning dreams, it appears that their nature depends both on the state of the human body and on that of the mind. But were they owing to the agency of other spiritual beings, how could they be influenced by the state of the body? Those must be a *curious* set of spiritual beings who depend in such a manner on the state of our corporeal frame. Better not to allow them existence at all, than to place them in such a dependance.

Wolffius, and after him M. Formey, have supposed, that dreams never arise in the mind, except in consequence of some of the organs of sensation having been previously excited. Either the ear or the eye, or the organs of touching, tasting, or smelling, communicate information, somehow, in a tacit, secret manner; and thus partly rouse its faculties from the lethargy in which they are buried in sleep, and engage them in a series of confused and imperfect exertions. But what passes in dreams is so very different from all that we do when awake, that it is impossible for the dreamer himself to distinguish, whether his powers of sensation *perform* any part on the occasion. It is not necessary that imagination be always excited by sensation. Fancy, even when we are awake, often wan-

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ders from the present scene. *Absence of mind* is incident to the studious: the poet and the mathematician many times forget where they are. We cannot discover from any thing that a person in dreaming displays to the observation of others, that his organs of sensation take a part in the imaginary transactions in which he is employed. In those instances, indeed, in which persons asleep are said to hear sounds; the sounds which they hear are said also to influence, in some manner, the nature of their dreams. But such instances are singular. Since then it appears that the person who dreams is himself incapable of distinguishing either during his dreams, or by recollection when awake, whether any new impressions are communicated to him in that state by his organs of sensation; that even by watching over him, and comparing our observations of his circumstances and emotions, in his dreams, with what he recollects of them after awaking, we cannot, except in one or two singular instances, ascertain this fact; and that the mind is not incapable of acting while the organs of sensation are at rest, and on many occasions refuses to listen to the information which they convey; we may, without hesitation, conclude, that the theory of Wolffius and Formey has been too hastily and incautiously advanced.

Other physiologists tell us, that the mind, when we dream, is in a state of *delirium*. Sleep, they say, is attended with what is called a *collapse* of the brain; during which either the whole or a part of the nerves of which it consists, are in a state in which they cannot carry on the usual intercourse between the mind and the organs of sensation. When the whole of the brain is in this state, we become entirely unconscious of existence, and the mind sinks into inactivity: when only a part of the brain is *collapsed*, as they term it, we are then neither asleep nor awake, but in a sort of delirium between the two. This theory, like the last mentioned, supposes the mind incapable of acting without the help of sensation: it supposes that we know the nature of a state of which we cannot ascertain the phenomena; it also contradicts a known fact, in representing dreams as confused images of things around us, not fanciful combinations of things not existing together in nature or in human life. We must treat it likewise, therefore, as a baseless fabric.

In the last edition of this work, a theory somewhat different from any of the foregoing was advanced on this subject. It was observed, that the nervous fluid, which is allowed to be secreted from the blood by the brain, appears to be likewise absorbed from the blood by the extremities of the nerves. It was farther advanced, that as this fluid was to be considered as the principle of sensibility; therefore, in all cases in which a sufficient supply of it was not absorbed from the blood by the extremities of the nerves, the parts of the body to which those nerves belonged, must be, in some degree, deprived of sensation. From these positions it was inferred, that as long as impressions of external objects continue to communicate a certain motion from the sentient extremities of the nerves to the brain,—so long we continue awake; and that, when

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(A) The writer of this article has been told by a respectable old gentleman of his acquaintance, since dead, that he had frequently dreams of this nature. The fact may therefore be considered as unquestionable.

Dreams.

there is a deficiency of this vital fluid in the extremities of the nerves, or when from any other cause it ceases to communicate to the brain the peculiar motion alluded to, we must naturally fall *asleep*, and become insensible of our existence. It followed of consequence, that, in sleep, the nervous fluid between the extreme parts of the nerves and the brain must either be at rest, or be deficient, or be prevented by some means from passing into the brain: and it was concluded, that whenever irregular motions of this fluid were occasioned by any internal cause, *dreaming* was produced.—In this manner it appeared that we might be deceived with regard to the operation of any of the senses;—so as to fancy that we saw objects not actually before us,—to hear imaginary sounds,—to taste,—to feel, and to smell in imagination. The instances of visions which will sometimes arise, and as it were swim before us when awake, though our eyes be shut, *tinnitus aurium*, which is often a symptom in nervous diseases, and the strange feelings in the case of the amputated limb, were produced in proof of this theory, and applied so as to confirm it.

We are still of opinion, that this theory is more plausible, and goes farther towards explaining the nature of *dreaming*, and the manner in which *dreams* are produced, than any other with which we are acquainted. But it must be confessed, upon a review, that even in it there is too much supposition. The nature of the nervous fluid is but imperfectly known, and even its existence not very fully ascertained. The nature of the connection by which the soul and body are united, seems to be almost beyond our comprehension. And till we can apply experiment and observation in a better manner to this branch of physiology, it must undoubtedly remain unknown. To something mysterious in the nature of that connection, the delusion produced in dreams is in all probability owing.

Amid this uncertainty with respect to the manner in which our powers of mind and body perform their functions in dreaming; it is pleasing to find that we can, however, apply to useful purposes the imperfect knowledge which we have been able to acquire concerning this series of phenomena. Our dreams are affected by the state of our health, by the manner in which we have passed the preceding day, by our general habits of life, by the hopes which we most fondly indulge, and the fears which prevail most over our fortitude when we are awake. From recollecting our dreams, therefore, we may learn to correct many improprieties in our conduct; to refrain from bodily exercises, or from meats and drinks that have unfavourable effects on our constitution; to resist, in due time, evil habits that are stealing upon us; and to guard against hopes and fears which detach us from our proper concerns, and unfit us for the duties of life. Instead of thinking what our dreams may forebode, we may with much better reason reflect by what they have been occasioned, and look back to those circumstances in our past life to which they are owing. The sleep of innocence and health is sound and refreshing; their dreams delightful and pleasing. A distempered body, and a polluted or perturbed mind, are haunted in sleep with frightful, impure, and unpleasing dreams.

Some very beautiful fables have been written both by ancients and moderns in the form of dreams. The *Somnium Scipionis* is one of the finest of Cicero's compositions. He who shall carefully peruse this piece with Macrobius's commentary upon it, will acquire from them considerable knowledge of ancient philosophy. In the periodical publications, which have diffused so much elegant and useful knowledge through Britain, the *Tatlers*, *Spectators*, *Guardians*, &c. we find a number of excellent dreams. Addison excelled in this way of writing. The public are now less partial to this species of composition than they formerly were.

Dr Beattie, in his valuable essay on the subject of dreaming, quotes a very fine one from the *Tatler*, and gives it due praise.

The reader who is disposed to speculate farther on this subject, may consult Beattie's *Essays*, Hartley on *Man*, and the principal writers on physiology.

DRELINCOURT (Charles), minister of the reformed church at Paris, was born at Sedan in 1595, where his father enjoyed a considerable post. He had all the qualifications that compose a respectable clergyman; and though he defended the Protestant cause against the Romish religion, was much esteemed even among the Catholics. He is best known in England by his *Consolations against the Fears of Death*, which work was translated, and is often printed. He married the daughter of a rich merchant at Paris, by whom he had 16 children. His third son, professor of physic at Leyden, was physician to the Prince and Princess of Orange before their accession to the crown of England. Bayle has given him a high character. Mr Drelincourt died in 1660.

DRENCH, among farriers, a physical potion for horses. The ingredients for this purpose are to be beat coarsely, and either mingled with a decoction or with wine. Then let all infuse about a quarter of an hour, and give it to the horse with a horn after he has been tied up two hours to the rack.

DREPANE, the ancient name of Corcyra, from the curvity of its figure, resembling a sickle.

DREPANE, *Drepanum*, (anc. geog.), a town of Bithynia, situated between the Sinus Astacenus and the Bosphorus Thracius; called *Helenopolis* by Constantine, in honour of his mother Nicephorus Callistus.

DREPANUM (anc. geog.), the promontory Rhium in Achaia; so called because bent in the manner of a sickle.—Another *Drepanum* on the Arabic Gulf, on the side of Egypt. A third on the north side of Crete, situated between Cydonia and the Sinus Amphimallus. A fourth on the west side of Cyprus. A fifth, a promontory of Cyrenaica, on the Mediterranean.

DREPANUM, -i, or *Drepana*, -orum, a town and port on the west side of Sicily, and to the west of mount Eryx: *Drepanitani* the people. Now *Trepano*, a city and port-town on the westmost point of Sicily. E. Long. 12. 8. Lat. 38. 0.

DRESDEN, the capital city of the electorate of Saxony in Germany. It is seated on the river Elbe, which divides it into two parts. One part is called *Old Dresden*, and the other the *New Town*, in the German language *New Stadt*. They are joined together by a stone bridge, supported by 19 piers, and 630 paces in length.

Drelin-
court
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Dresden.

Dresden,
Dressing.

length. As this bridge was too narrow for the crowds of people that were continually passing and repassing, King Augustus, in 1730, caused two walks for foot-passengers to be built, one on each side, in a very wonderful manner; the one for those that go into the city, and the other for those that return back. These are bordered with iron pallisades of curious workmanship. Dresden is surrounded by strong and handsome fortifications; and contains, according to the latest accounts, 110,000 inhabitants.

All the buildings of this city are constructed with square free stone, and are almost all of the same height. They have stone from the neighbourhood of Pirna, about ten miles from this city, which is readily brought down the Elbe. In general the houses are high and strong; the streets wide, straight, well paved, clean, and well illuminated in the night; and there are large squares, disposed in such a manner, that Dresden may pass for one of the handsomest cities in the world. The elector's palace is a magnificent structure, and abounds in many valuable curiosities both of nature and art. The collection of pictures is reckoned one of the finest that exists, and is valued at 500,000 l.

Above 700 men are here constantly employed in the porcelain manufacture, the annual expence of which is estimated at no more than 80,000 crowns; and the manufacture yields to the king 200,000 crowns yearly, besides the magnificent presents which he occasionally makes, and the large quantity reserved for the use of his household.

The other most considerable article of trade is silver, of which the mines near Fridburg produce every 15 days near the value of 20,000 dollars. The metal is brought into the city in ingots, where it is immediately coined and delivered to the proprietors.

The court of Dresden is one of the most remarkable in Europe for splendor and profusion. Six thousand five hundred ducats are yearly allowed for comfits and similar articles, which is near twice as much as the king of Prussia allows for the whole expence of his table. The revenues of the elector are estimated at about 1,576,000 l.; which arise from the taxes on lands, and a capitation of six dollars on all males as soon as they commence an apprenticeship or begin to work. People of a higher rank are taxed according to their class, and are liable to be called to account if they assume not an exterior appearance correspondent to the extent of their fortune. Every foreigner pays capitation after residing six months in the country. The Jews are taxed at 50, their wives at 30, and their children at 20 dollars. There is also an excise on all eatables and liquors; and 10 per cent. is levied out of the incomes of the people.

Though this city lies in a low situation, yet it hath agreeable prospects. It is supplied with a prodigious quantity of provisions, not only out of the neighbourhood, but from Bohemia, which are brought every market-day, which is once a-week. E. Long. 13. 34. N. Lat. 51. 12.

DRESSING of HEMP and FLAX. See *FLAX-Dressing*.

DRESSING of Meats, the preparing them for food by means of culinary fire.

The design of dressing is to loosen the compages or

texture of the flesh, and dispose it for dissolution and digestion in the stomach. Flesh not being a proper food without dressing, is alleged as an argument that man was not intended by nature for a carnivorous animal.

The usual operations are roasting, boiling, and stewing.—In roasting, it is observed, meat will bear a much greater and longer heat than either in boiling or stewing; and in boiling, greater and longer than in stewing. The reason is, that roasting being performed in the open air, as the parts begin externally to warm, they extend and dilate, and so gradually let out part of the rarefied included air, by which means the internal succussions, on which the dissolution depends, are much weakened and abated. Boiling being performed in water, the pressure is greater, and consequently the succussions to lift up the weight are proportionably strong; by which means the coction is hastened: and even in this way there are great differences; for the greater the weight of water, the sooner is the business done.

In stewing, though the heat be infinitely short of what is employed in the other ways, the operation is much more quick, because performed in a close vessel, and full; by which means the succussions are oftener repeated, and more strongly reverberated. Hence the force of Papin's digester; and hence an illustration of the operation of digestion.

Boiling, Dr Cheyne observes, draws more of the rank strong juices from meat, and leaves it less nutritive, more diluted, lighter, and easier of digestion: roasting, on the other hand, leaves it fuller of the strong nutritive juices, harder to digest, and needing more dilution. Strong, grown, and adult animal food, therefore, should be boiled; and the younger and tenderer roasted.

DRESSING, in surgery, the treatment of a wound or any disordered part. The apparatus of dressing consists of drossils, tents, plasters, compresses, bandages, bands, ligatures, and strings. See *SURGERY*.

DREXELIUS (Jeremiah), a Jesuit celebrated for his piety and writings, was born at Aufburg, and became preacher in ordinary to the elector of Bavaria. He wrote several pious and practical pieces, which have been printed together in two volumes folio; and died in 1638.

DREVET (Peter) the Younger, an eminent French engraver, was a member of the royal academy of painting and sculpture; and died at Paris in 1739, at 42 years of age. His portraits are neat and elegant; but laboured to the last degree. He particularly excels in representing lace, silk, fur, velvet, and other ornamental parts of dress.—His father was excellent in the same art; and had instructed, but was surpassed by the son. The younger Drevet did not confine himself to portraits. We have several historical prints by him, which in point of neatness and exquisite workmanship are scarcely to be equalled. His most esteemed and best historical print is very valuable; but the first impressions of it are rarely to be met with: it is, The Presentation of Christ in the Temple; a very large plate, lengthwise, from Louis de Bologna. The following deserve also to be particularized. The Meeting of Abraham's Servant with Rebecca at the Well;

Dressing
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Drevet.

Dreux
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Drill.

Well; a large upright plate, from An. Coypel: and Abraham, with his Son Isaac on the Altar, the same, from the same, dated 1707; the first impressions of which are before the work upon the right thigh of Isaac was altered, the curved lines from the button almost down to the knee being in those impressions arched downwards, but in posterior ones arched upwards. Among his portraits, the two following are justly held in the highest estimation: M. Bossuet Bishop of Meaux; a whole-length figure standing, a middling sized upright plate, from Rigaud: and Samuel Bernard; a whole-length figure sitting in a chair, a large upright plate. The first impressions of the last are, before the words *Conseiller d'Etat* were inserted upon the plate.

DREUX, a town in the Isle of France, remarkable for its antiquities; and for the battle which was fought in December 1562 between the Papists and the Protestants, wherein the former gained the victory. Some think it took its name from the priests of Gaul, called the *Druids*, in the times of Paganism. It consists of two parishes, St Stephen's and Notre Dame, called the *great church*, which is pretty well built. It is seated on the river Blaise, at the foot of a mountain, on which is a ruined castle. E. Long. 1. 27. N. Lat. 48. 44.

DRIEPEL, or DNIEPER, a river of Russia, which rises in the forest of Volkonski, near the source of the Volga, about 100 miles from Smolensko. It passes by Smolensko and Mohilef, separates the Ukraine from Poland, flows by Kiof, and falls into the Black Sea between Otsakof and Kinburn. By the acquisition of the province of Mohilef, its whole course is now included within the Russian territories. It begins to be navigable at a little distance above Smolensko, though in some seasons of the year it is so shallow near the town, that the goods must be transported upon rafts and small flat-bottomed boats.

DRIFT, in navigation, the angle which the line of a ship's motion makes with the nearest meridian, when she drives with her side to the wind and waves, and is not governed by the power of the helm: it also implies the distance which the ship drives on that line.

A ship's way is only called *drift* in a storm; and then when it blows so vehemently as to prevent her from carrying any sail, or at least restrains her to such a portion of sail as may be necessary to keep her sufficiently inclined to one side, that she may not be dismasted by her violent labouring produced by the turbulence of the sea.

DRIFT, in mining, a passage cut out under the earth betwixt shaft and shaft, or turn and turn; or a passage or way wrought under the earth to the end of a meer of ground, or part of a meer.

DRIFT-Sail, a sail used under water, veered out right a-head by sheets, as other sails are. It serves to keep the ship's head right upon the sea in a storm, and to hinder her driving too fast in a current.

DRILL, in mechanics, a small instrument for making such holes as punches will not conveniently serve for. Drills are of various sizes, and are chiefly used by smiths and turners.

DRILL, or *Drill-Box*, a name given to an instrument for sowing land in the new method of horse-hoeing husbandry. See AGRICULTURE.

DRILL-Sowing, a method of sowing grain or seed

of any kind, so that it may all be at a proper depth in the earth, which is necessary to its producing healthful and vigorous plants. For this purpose a variety of drill-ploughs have been invented and recommended; but from the expence attending the purchase, and the extreme complication of their structure, there is not an instrument of that kind, as yet discovered, that is likely to be brought into general use. This method, however, is greatly recommended in the Georgical Essays, where we have the following observations and experiments.—“ Grain sown by the hand, and covered by the harrows, is placed at unequal depths; the seeds consequently sprout at different times, and produce an unequal crop. When barley is sown late, and a drought succeeds, the grain that was buried in the moisture of the earth soon appears, while such as was left near the surface lies baking in the heat of the sun, and does not vegetate till plentiful rains have moistened the soil. Hence an inequality of the crop, an accident to which barley is particularly liable. The same observation, but in a more striking manner, may be made upon the sowing of turnips. It frequently happens that the husbandman is obliged to sow his seed in very dry weather, in hopes that rain will soon follow; and either rolls or covers it with a bush-harrow. We will suppose, that, contrary to his expectations, the dry weather continues. The seed, being near the surface, cannot sprout without rain. The husbandman is mortified at his disappointment, but is soon satisfied and made easy by a perfect acquiescence in what he thinks is the will of Providence. The scourge that he feels must not be placed to the dispensation of Providence, but has its source in the ignorance of the man himself. Had he judiciously buried the seed in the moist part of the soil with the drill plough, or harrowed it well with the common harrow, his seed would have vegetated in due season, and bountifully repaid him for his toil.

“ In the year 1769, a 15 acre close was prepared for turnips. The land was in fine condition as to lightness, and had been well manured. On the 24th of June, 14 acres were sown with turnip-seed broad-cast, and harrowed in with a bush-harrow. The remaining acre was sowed the same day with the drill-plough, allowing 14 inches between the rows, and the shares being set near two inches deep. At the time of sowing, the land was extremely dry, and the drought continued from the time of sowing to the 5th of July: so that the broad-cast did not make its appearance till about the 8th of that month, at which time the drill turnips were in rough leaf, having appeared upon the surface the sixth day after sowing.

“ In the driest seasons, at the depth of two inches, or less, we are sure of finding a sufficiency of moisture to make the seed germinate. When that is once accomplished, a small degree of moisture will carry on the work of vegetation, and bring the tender plants forward to the surface. When extreme dry weather obliges the broad-cast farmer to sow late, he has no opportunity of sowing a second time if the fly should get into the field. The drill secures him in some degree against that misfortune, by giving him a full command over the seasons.

“ The excellence of the drill-plough is not confined to turnip-seed; it is an useful instrument for sowing all kinds

Drill.

Drill
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Drink.

kinds of grain. By burying the seeds at an equal depth, it secures an equal crop in all circumstances of the weather. But this is not the only consideration to the cultivator. It saves near one half of his seed, which is an object of importance to the tillage farmer.

"In the spring of the year 1769, an acre of barley was sowed in equidistant rows with the drill-plough, in a field which was sown with the same grain and upon the same day broad-cast.—The broad-cast took three bushels per acre; the drill required only six pecks. The drills were eight inches asunder, and the seed was lodged about two inches within the soil. The drill acre was finished within the hour, and the most distinguishing eye could not discover a single grain upon the surface.

"In the course of growing, the drill barley seemed greener and bore a broader leaf than the broad-cast. When the ears were formed throughout the field, the ear of the drill barley was plainly distinguished to be near half an inch longer than the broad-cast, and the grains seemed fuller and better fed.

"Drill-sowing, however, though it may be recommended as a most rational and judicious practice, has many difficulties to overcome, and perhaps will never be brought into general use. A proper instrument is wanting that would come cheap to the farmer, and have the requisites of strength and simplicity to recommend it. The present instruments cannot by any means be put into the hands of common servants. Should we ever be so happy as to see this objection removed, it is probable that all kinds of grain will be cultivated in drills. Corn growing in that manner has a freer enjoyment of air, and the farmer has an opportunity of hand-hoeing and weeding without injury to the growing crop. This is an object of the utmost consequence in the cultivation of beans and winter corn.

"The best instrument for drilling of grain is the invention of the ingenious Mr Craick, and made by Mr Crichton coach-maker in Edinburgh. It works with four coulter, and the price is 12l. With it, one man, a horse, and a boy, can easily sow four acres a-day."

DRILLING is popularly used for exercising soldiers. The word is derived from the French *drille*, which signifies a *raw soldier*.

DRIMYS, in botany: A genus changed by Murray, in the 14th edit. of *Syst. Veget.* to WINTERA; which see.

DRINK, a part of our ordinary food in a liquid form. See Food.

The general use of drink is, to supply fluid; facilitate solution; in consequence of that, to expedite the evacuation of the stomach, and promote the progress of the aliment through the intestines: for, by the contraction of the longitudinal fibres of the stomach, the pylorus is drawn up, and nothing but fluid can pass; which, by its bulk, makes a hurried progress through the intestines, and so determines a greater excretion by stool, as less then can be absorbed by the lacteals. Hence a large quantity of common water has been found purgative; and, *ceteris paribus*, that aliment which is accompanied with the largest proportion of drink, makes the largest evacuation by stool. Here a question has arisen, about where the feculent part of the aliment is first remarkably collected. It is commonly thought to be in the great guts: but undoubtedly it often begins in the lower part of the ileum,

especially when the drink is in small proportion, and when the progress of the aliment is slow; for when the contents of the guts are very fluid, they are quickly pushed on, and reach the great guts before they deposit any feculency. Another effect of drink is, to facilitate the mixture of the lymph, reflux from every part of the system, with the chyle. In the blood-vessels, where all must be kept fluid in order to proper mixture, drink increases the fluidity, and gives tension, by its bulk, without concomitant acrimony or too much elasticity, and so strength and oscillatory motion: hence drink contributes to sanguification, as sometimes food gives too dense a nutriment to be acted upon by the solids; and hence also we can see how drink promotes the secretions. These are the effects of drink in general; but what has been said must be taken with some limitations; for the more liquid the food, it is sooner evacuated, and less nourishment is extracted. Hence drink is, in some degree, opposed to nourishment; and so, *ceteris paribus*, those who use least drink are most nourished.

All the effects of drink above mentioned are produced by simple water; and it may be said, that other liquors are fit for drink in proportion to the water they contain. Water, when used as drink, is often impregnated with vegetable and farinaceous substances; but, as drinks, these impregnations are of little consequence: they add, indeed, a little nourishment; but this is not to be regarded in a healthy state. Sometimes we impregnate water with the *fructus acidodulces*; and then, indeed, it acquires other qualities, of considerable use in the animal economy. All drinks, however, may be reduced to two heads: first, pure water, or where the additional substance gives no additional virtue; secondly, the *fermentata*. Of the first we have already spoken; and the latter have not only the qualities of the first, but also qualities peculiar to themselves.

Fermented liquors are more or less poignant to the taste, and better calculated to quench thirst. Thirst may be owing to various causes: first, to defect of fluid in the system, which occasions a scanty secretion in the mouth, fauces, and stomach; the dryness of the mouth and fauces will also in this case be increased, by their continual exposure to the perpetual flux and reflux of the evaporating air. Secondly, thirst depends on a large proportion of solid viscid food: thirdly, on an alkalescent aliment, especially if it has attained anything of the putrefactive taint: fourthly, on the heat of the system; but this seems to operate in the same manner as the first cause, giving a sense of dryness from its dissipation of the fluids. The fermented liquors are peculiarly adapted for obviating all these causes; stimulating the mouth, fauces, and stomach, to throw out the saliva and gastric liquor by their poignancy: by their acescency they are fitted to destroy alkalescent acrimony, to quench thirst from that cause: by their fluidity they dilute viscid food; though here, indeed, they answer no better than common water. In two ways they promote the evacuation by stool, and progress through the intestines: first, by their fluidity and bulk; secondly, by their acescency, which, uniting with the bile, forms the peculiar stimulus formerly mentioned. Carried into the blood-vessels, in so far as they retain any of the saline nature, they stimulate the

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Drink
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Driving.

excretories, and promote urine and sweet; correcting thus alkalescency, not only by mixture, but dissipation of the degenerated fluids.

Many physicians, in treating of fermented liquors, have only mentioned these qualities, rejecting their nutritious virtue, which certainly ought to be taken in; though by expediting the evacuation by stool they make less of the nutritious parts of the aliment to be taken up, and by stimulating the excretories make these nutritious parts to be for a shorter time in the system. All these and many more effects arise from fermented liquors. Their acescency sometimes promotes the disease of acescency, by increasing that of vegetables, acting as a ferment, and so producing flatulency, purging, cholera, &c.: so that, with vegetable aliment, as little drink is necessary, the most innocent is pure water; and it is only with animal food that fermented liquors are necessary. In warmer climates, *fermentata* would seem necessary to obviate alkalescency and heat. But it should be considered, that though fermented liquors contain an acid, yet they also contain alcohol; which, though it adds stimulus to the stomach, yet is extremely hurtful in the warmer climates, and wherever alkalescency prevails in the system. Nature, in these climates, has given men an appetite for water impregnated with acid fruits, *e.g.* sherbet; but the use of this needs caution, as in these countries they are apt to shun animal food, using too much of the vegetable, and often thus causing dangerous refrigerations, choleræ, diarrhœas, &c.

Of varieties of fermented liquors. We shall only mention here the chief heads on which these varieties depend. First, they are owing to the quality of the subject, as more or less viscid; and to its capacity also of undergoing an active fermentation, although perhaps the more viscid be more nutritious. Hence the difference between ales and wines; by the first meaning fermented liquors from *farinacea*, by the second from the fruits of plants. It depends, secondly, on the acerbity, acidity, nature, and maturation, of the fruit. Thirdly, the variety depends on the conduct of the fermentation. In general, fermentation is progressive, being at first active and rapid, detaching the fixed air or *gas sylvestre*, at the same time acquiring more acid than before. These qualities of flatulency and acidity remain for some time; but as the fermentation goes on, the liquor becomes more perfect, no air is detached, and alcohol is produced; so that fermented liquors differ according to the progress of the fermentation, and have different effects on the system. When fermentation is stopped before it comes to maturity, though naturally it proceeds in this way, yet by addition of new ferment it may again be renewed with a turbid intestine motion.

DRIVERS, among sportsmen, a machine for driving pheasant-powts, consisting of good strong ozier wands, such as the basket-makers use; these are to be set in a handle, and twisted or bound with small oziers in two or three places. With this instrument the sportsman drives whole eyes of young powts into his nets. See the next article.

DRIVING, among sportsmen, a method of taking pheasant-powts. It is thus: The sportsman finds out the haunts of these birds; and having fixed his nets there, he calls upon them together by a pheasant-call,

imitating the voice of the dam; after this he makes a noise with his driver, which will make them run a little way forward in a cluster; and this he is to repeat till he has made sure of them, which an expert sportsman never fails to do, by driving them into his nets.

DRIVING, in metallurgy, is said of silver, when, in the operation of refining, the lead being burnt away, the remaining copper rises upon its surface in red fiery bubbles.

DRIVING, in the sea-language, is said of a ship, when an anchor being let fall will not hold her fast, nor prevent her sailing away with the wind or tide. The best help in this case is to let fall more anchors, or to veer out more cable; for the more cable she has out, the safer she rides. When a ship is a-hull or a-try, they say she drives to leeward.

DROGHEDA, by the English called *Tredah*, a town of Ireland, in the province of Leinster and county of Lowth, and situated on a bay of the same name, in W. Long. 6. 17. N. Lat. 53. 45. It was formerly very remarkable for its situation and strength. In consequence of this it was much distinguished by the old English monarchs. Edward II. granted it a market and fair; and to these were added other great privileges in succeeding ages, particularly the right of coinage. It was bravely defended against the rebels in 1641. After the cessation of arms it was taken by the duke of Ormond and the earl of Inchiquin; but was retaken by Cromwell in 1649. At this time it suffered so much, that for a long time after it remained almost in ruins. The buildings were exceedingly shattered; and the town being taken by storm, not only the garrison, but the inhabitants, men, women, and children, were mostly put to the sword. By degrees, however, it recovered, and is at present a large and populous place. It is a town and county; and as such sends two representatives to parliament. It has a great share of inland trade, and an advantageous commerce with England: and though the port is but indifferent, and narrow at its entrance, with a bar over which ships of burden cannot pass but at high water, yet a great deal of business is done; so that, from a low and declining port, it is now become rich and thriving.

Drogheda is perhaps one of the strongest instances that can be mentioned of the inestimable benefit of a river in any degree navigable: for though the Boyne is not capable of carrying vessels bigger than barges, or pretty large boats, yet the conveniency that this affords of conveying coals by water-carriage through a great extent of country, introduced a correspondence between this place and Whitehaven in Cumberland, to which the revival of its commerce has been in a great measure owing.

DROITWITCH, a town of Worcestershire in England, noted for excellent white salt made from the salt springs in its neighbourhood. It sends two members to parliament. W. Long. 2. 16. N. Lat. 52. 20.

DROMEDARY. See CAMELUS.

DROMORE, a town of Ireland, in the county of Down. It is a very ancient town, and the seat of a bishopric. The see was founded by St Colman in the 6th century. It was refounded by King James I. who, by his charters (now preserved in the Rolls-office), granted it very great and uncommon privileges. Among other

Driving
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Dromore.

Drone.

other marks of royal favour, he distinguishes the bishops of this see by the style of "A. B. by Divine Providence bishop of Dromore:" whereas all other bishops in Ireland, except those of Meath and Kildare, are styled, "by Divine Permission." This see, although the least in its extent, is so complete and perfect in its endowment and jurisdiction, that it need not envy the greatest and most opulent.

DRONE, a kind of large bees which make their appearance in hives about the month of May, but never work nor prepare any honey; and are at last all killed by the rest. Under the article BEE, *nº 20 et seq.* we have given an account of the experiments of Messrs Debray and Schirach concerning these animals: but since that article was printed, a Treatise upon Bees and their Management has appeared by Mr Bonner near Berwick on Tweed, who has made the management of bees his study for a great number of years, and who dissents from the opinions of the above mentioned gentlemen for the following reasons, which we shall give in his own words. Having mentioned the opinions of Mr Debray concerning the little drones mentioned in the article above mentioned, he proceeds thus:

"1. Can it be thought that the prying eyes of multitudes in many generations should have escaped seeing those little drones (they being, according to his account, vastly numerous) thrust their posterior parts into the cells? Yet none ever saw them do it except himself; while many have seen the queen do it, though but a single bee.

"2. It is well known the queen is very long behind the wings, wise nature having made her so, in order that she might thrust her posterior part into the cells, and yet her wings scarcely touch them, nor receive the least injury. If these imaginary little drones had to thrust their posterior parts into the cells in the same manner as the queen, certainly their wings would have been made in the same manner short, and their posterior parts long and taper, which is not the case. Whereas were a bee of any kind (the queen excepted) to thrust its hinder part into a common cell, its wings or coats would come over its head, and be antic like, and injure both them and its body. Besides, I scarcely think they could get into the common cells that way at any rate for want of room.

"3. Mr Debray grants, that without a queen or eggs bees will not begin to work, as well knowing they cannot propagate their species without her; and yet he says, those bees which wanted little drones began to work, and the queen laid eggs, and all went forward, till they were not impregnated, and then they gave over work, and deserted the hive. Certainly those sagacious creatures would have been as sensible that they wanted drones at the very first, when they were put into the hive, and that they could not do without them, as they are sensible when they want a queen, and that it is needless to begin work without her; and it might be added, that two different kinds of drones in one hive does not appear to be probable, or serve any end.

"But I shall narrate some of my own experiments on that head, which will put it, I hope, beyond dispute: On September 1st, I had a hive breeding fast; I took out all her bees (among which were only four large

drones, which I killed), and I put them in a hive that had nothing in her but empty combs: I waited ten days, when, by looking between the combs, I saw her have new-sealed up maggots in her cells. I then took all her bees out, and shook them into a tub full of water, and recovered them gradually; and when recovering, I pressed every one of them, in order to see if I could find any of those little drones, but could not find one; but all and every one of them had stings: they were in number 3000. After which I searched the hive I took them out of, and cut out all her combs that had eggs in them, and found they had new laid eggs, four days old eggs, and maggots in them. I then recovered the queen and all the bees, and put in the same hive again, which had not an egg in her now, and waited other twenty days, and saw her in five days working very well; a sure indication she was breeding again. I then turned her up, and cut out one of her brood-combs, and saw in it new laid eggs, four days old eggs, and maggots, and some young almost fit for emerging out of their cells.

"The very same day I made a further experiment: I had a hive which I saw had some brood-combs in her, but she had not had a large drone for four weeks before in her: she had not above 500 bees in her, which favoured me, because few in number. I took the hive into a close place in my house, in order that not a single bee should escape me: I then took all her bees out of her, and immersed them in water; and when recovering, I pressed every one of them, and each bee had a sting, as in the former experiment.

"I think the above experiments may satisfy any judicious person, that there is no such thing in being as little drones, unless in Mr Debray's brain. And if Mr Debray, who can find 57 in a small swarm of bees, will send me the odd seven, I will send him one of my best hives for them, and he will scarcely think he is ill paid. I add, I never saw a hive in spring, however few bees in her, but she bred some if she had a queen, though to be sure few in proportion to her bees.

"By this time the reader will be very ready, no doubt, to ask me the use of the drones. I beg to be excused on that head, as I have not the least idea of their use in a hive; they do not fecundate the queen, for she can lay and breed too though she never see them. Their heat does not appear to me to be necessary for hatching the young, as they are mostly hatched before any are bred in a hive: and when drones are in the hive, the weather is so warm, and so many common bees in it, that they appear to have rather too much heat, by their lying out of the hives often.

"I have many times had good hives with few or no drones in them all the year: and Keys is quite wrong when he says a top swarm will not do without drones in her; for I am positive to the contrary, as in the summer 1785 I took off four swarms of mine own in one day with not a single drone in any of them, and they all throve well, and bred drones in themselves about four weeks after.

"Although I cannot say what use the drones are of to a hive (unless it be to help away with a great deal of her honey, which they are very good at), yet the best hives have them soonest in the year, they generally appearing in such about the latter end of May, and

Drone.

Drone,
Drops.

and the bees put a period to their lives about Lammas, at which time I give them all the assistance I can. The way they kill them is thus: They pull and bite them with their teeth, and sting them also. I have seen great havoc made of them in one day, as appeared by their lying dead before the door of the hive. But their most effectual way of killing them is their banishing them from the honey-combs; upon which the drones betake themselves to the under edges of the hives in great numbers, and to the board the hive stands on; and sometimes, though rare, I have even seen them come to the outside of the hive, and cluster there about the bulk of a man's hand. When they are banished thus, they are very dull and lifeless: and I have lifted up a hive from the board, and there they would have been sitting close on it, with scarcely three or four common bees among them; and I have trod to death 40 or more at a time.

"We may now take a view of the disadvantages attending the old, and also Mr Debraw's principles on bees, were they true; and next see how a hive of bees may be preserved from coming to ruin, according to my sentiments on them.

"1. The old principles on bees say, that without a queen or royal cell be in a hive, it will come to ruin.

"2. Mr Debraw's principles say, that without little drones be in a hive it will come to ruin.

"3. I say, if a hive have only new laid eggs in her (which may be easily got the greatest part of the year, in case she have none of her own) and common bees, she will find herself a queen, and so thrive.

"According to the old principles, it is easily seen that in case a hive lose her queen when there is no royal cell in her, and no queen can be got to put to her (neither of which can be expected but in June and July), she is entirely ruined.

"According to the Frenchman's scheme, there must be drones in a hive at all times of the year to fecundate the eggs, otherwise the hive is useless. Supposing his sentiments to be true (which however can by no means be admitted, seeing there is no such thing as little drones), how perplexed would the owner be to know when there were little drones in his hives! When he wanted to make an artificial swarm, he might bring off a queen and common bees with her: but how should he come to know whether there were any, or a sufficient quantity, of little drones among them, as they cannot be distinguished from the commons but by immersion and pressure, which would be intolerably troublesome, and next to killing the bees, and not at all practicable? All that could be done would be to hope the best, that there were little drones in her at any time of the year.

"I say, if a queen die in a hive, and that hive have some new-laid eggs in her, or some put to her, in case she have none of her own, she will nourish up some of these eggs to be a queen to herself: and also by taking out a queen and some commons out of a hive (without a single drone, large or small), and putting them in an empty hive, will make a swarm, and the old hive will breed herself a queen again if she have eggs in her."

DRONE-Fly, a two-winged insect, extremely like the common drone-bee, whence also the name.

DROPS, in meteorology, small spherical bodies which the particles of fluids spontaneously form them-
N^o 104.

selves into when let fall from any height. This spherical figure, the Newtonian philosophers demonstrate to be the effect of corpuscular attraction; for considering that the attractive force of one single particle of a fluid is equally exerted to an equal distance, it must follow that other fluid particles are on every side drawn to it, and will therefore take their places at an equal distance from it, and consequently form a round superficies. See the articles *ATTRACTION*, *FLUID*, and *RAIN*.

DROPS, in medicine, a liquid remedy, the dose of which is estimated by a certain number of drops.

English DROPS, *Gutta Anglicana*, a name given to a chemical preparation esteemed of great virtue against vapours and lethargic affections, and purchased at 5000l. by king Charles II. from the inventor Dr Goddard. The medicine appeared to be only a spirit drawn by the retort from raw silk, and afterwards rectified with oil of cinnamon, or any other essential oil; and was in reality no better than the common sal volatile oleosum, or any of the volatile spirits impregnated with an essential oil, except that it was less disagreeable than any of them to the taste.

DROPSY, in medicine, an unnatural collection of water in any part of the body. See (the *Index* subjoined to) *MEDICINE*.

DROPWORT, in botany. See *FILIPENDULA*.

Water DROPWORT, in botany. See *OENANTHES*.

DROSERA, *ROS SOLIS*, or *Sun-Dew*, in botany: A genus of the pentagynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 14th order, *Gruinales*. The calyx is quinquefid, the petals five; the capsule unilocular, and quinquevalved at top; the seeds very numerous. There are three species, which grow naturally in boggy places in many parts of the kingdom. They seem to receive the name of *sun-dew* from a very striking circumstance in their appearance. The leaves, which are circular, are fringed with hairs supporting small drops or globules of a pellucid liquor like dew, which continue even in the hottest part of the day and in the fullest exposure to the sun. The whole plant is acrid, and sufficiently caustic to erode the skin: but some ladies know how to mix the juice with milk, so as to make it an innocent and safe application to remove freckles and sun-burn. The juice that exudes from it unmixed, will destroy warts and corns. The plant hath the same effect upon milk that the common butterwort hath; and like that too is supposed to occasion the rot in sheep.

DROWNING, signifies the extinction of life by a total immersion in water.

In some respects, there seems to be a great similarity between the death occasioned by immersion in water, and that by strangulation, suffocation by fixed air, apoplexies, epilepsies, sudden faintings, violent shocks of electricity, or even violent falls and bruises. Physicians, however, are not agreed with regard to the nature of the injury done to the animal system in any or all of these accidents. It is indeed certain, that in all the cases above mentioned, particularly in drowning, there is very often such a suspension of the vital powers as to us hath the appearance of a total extinction of them; while yet they may be again set in motion, and the person restored to life, after a much longer
sub-

Drops
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Drowning.

Drowning. submerſion than hath been generally thought capable of producing abſolute death. It were to be wiſhed, however, that as it is now univerſally allowed that drowning is only a ſuſpention of the action of the vital powers, phyſicians could as unanimouſly determine the means by which theſe powers are ſuſpended; becauſe on a knowledge of theſe means, the methods to be uſed for recovering drowned perſons muſt certainly depend.

Dr de Haen, who hath written a treatiſe on this ſubject, aſcribes this diverſity of opinion among the phyſicians to their being ſo ready to draw general concluſions from a few experiments. Some, having never found water in the lungs, have thought that it never was there; and others, from its preſence, have drawn a contrary concluſion. Some have aſcribed the death which happens in caſes of drowning, to that ſpecies of apoplexy which ariſes from a great fulneſs of the ſtomach. But this opinion our author rejects, becauſe in 13 dogs which he had drowned and afterwards diſſected, no ſigns of ſuch a fulneſs appeared. Another reaſon is drawn from the want of the common marks of apoplexy on the diſſection of the brain, and from the actual preſence of water in the lungs. He is of opinion, that the death of drowned perſons happens in conſequence of water getting into the lungs, and ſtopping the blood in the arteries. He then diſcuſſes the queſtion how far the blowing of air into the lungs is uſeful in recovering drowned people. If their death is to be aſcribed to the water entering the lungs, this practice, he obſerves, muſt be hurtful, as it will increaſe the preſſure on the blood-veſſels, or may even force the water into them; which, on the authority of Lewis's experiments, he alleges is poſſible. But, in ſpite of this reaſoning, he aſſerts, that from experience it has been found uſeful. He allows, that the practice of ſuſpending drowned people by the feet muſt be hurtful, by determining the blood too much to the head; but he obſerves, that remedies in ſome reſpects hurtful may be uſed when the advantages derived from them preponderate; and is of opinion, that the practice above mentioned may be uſeful by agitating the viſcera againſt each other, and thus renewing their motions. Cutting the larynx in order to admit air more freely to the lungs, he reckons to be of little or no uſe; but acknowledges, however, that it may ſometimes prove beneficial on account of the irritation occaſioned by the operation.

Dr Cullen, in his Letter to Lord Cathcart concerning the recovery of perſons drowned and ſeemingly dead, tells us, that "From the diſſection of drowned men, and other animals, it is known, that very often the water does not enter into the cavity of the lungs, nor even into the ſtomach, in any quantity to do hurt to the ſyſtem; and, in general, it is known, that, in moſt caſes, no hurt is done to the organization of the vital parts. It is therefore probable, that the death which enſues, or ſeems to enſue, in drowned perſons, is owing to the ſtoppage of reſpiration, and to the ceaſing, in conſequence, of the circulation of the blood, whereby the body loſes its heat, and, with that, the activity of the vital principle."

In the Phil. Tranſ. Vol. LXVI. Mr Hunter gives the following theory. The loſs of motion in drowning, ſeems to ariſe from the loſs of reſpiration; and the

immediate effect this has upon the other vital motions of the animal, at leaſt this privation of breathing, appears to be the firſt cauſe of the heart's motion ceaſing. It is moſt probable, therefore, Mr Hunter obſerves, that the reſtoration of breathing is all that is neceſſary to reſtore the heart's motion; for if a ſufficiency of life ſtill remains to produce that effect, we may ſuppoſe every part equally ready to move the very inſtant in which the action of the heart takes place, their actions depending ſo much upon it. What makes it very probable, that the principal effect depends upon throwing air into the lungs, is, that children in the birth, when too much time has been ſpent after the loſs of that life which is peculiar to the fetus, loſe altogether the diſpoſition for the new life. In ſuch caſes there is a total ſuſpention of the actions of life; the child remains to all appearance dead; and would die, if air was not thrown into its lungs, and the firſt principle of action by that means reſtored. To put this in a clearer light, Mr Hunter gives the reſult of ſome experiments made on a dog in 1755.—A pair of double bellows were provided, which were ſo conſtructed, that by one action air was thrown into the lungs, and by the other the air was ſucked out which had been thrown in by the former, without mixing them together. The muzzle of theſe bellows was fixed into the trachea of a dog, and by working them he was kept perfectly alive. While this artificial breathing was going on, the ſternum was taken off, ſo that the heart and lungs were expoſed to view. The heart then continued to act as before, only the frequency of its action was greatly increaſed. Mr Hunter then ſtopped the motion of the bellows; and obſerved that the contraction of the heart became gradually weaker and leſs frequent, till it left off moving altogether; but by renewing the operation, the motion of the heart alſo revived, and ſoon became as ſtrong and frequent as before. This proceſs was repeated upon the ſame dog ten times; ſometimes ſtopping for five, eight, or ten minutes. Mr Hunter obſerved, that every time he left off working the bellows, the heart became extremely turgid with blood, and the blood in the left ſide became as dark as that in the right, which was not the caſe when the bellows were working. Theſe ſituations of the animal, he obſerves, ſeem to be exactly ſimilar to drowning.

Dr Edmund Goodwyn, in a treatiſe lately published on this ſubject, has endeavoured to aſcertain the effects of ſubmerſion upon living animals in a more accurate manner than had hitherto been done. His firſt care was to determine the ſymptoms which took place before death; and to obſerve theſe, he procured a large glaſs bell in which the animals were to be immerſed. Having inverted, and filled this with water, he put into it ſeveral cats, dogs, rabbits, and ſmaller animals, conſining them among the water till they were apparently dead. In theſe experiments he obſerved, that immediately after ſubmerſion the pulſe became weak and frequent; there was an apparent anxiety about the breaſt, and ſtruggling to relieve it. In theſe ſtruggles the animal roſe to the top of the water, throwing out a quantity of air from the lungs. After this the anxiety increaſes, the pulſe becomes weaker, and the ſtruggles more violent; he riſes again to the ſurface, throws out more air from the lungs, and in his efforts

Drowning. to inspire, a quantity of water commonly passes into the mouth. The skin about the face and lips then becomes blue, the pulse ceases, the sphincters are relaxed, and the animal falls down without sense or motion. On dissecting the bodies of drowned animals, our author met with the following appearances: 1. The external surface of the brain was darker, but the vessels of it were not more turgid than usual, nor was there any appearance of extravasation. 2. The pulmonary arteries and veins were filled with black blood, and the lungs themselves contained some frothy liquid. 3. Notwithstanding these symptoms, the right auricle and ventricle were still contracting and dilating; the left sinus venosus and auricle moving feebly, but the left ventricle at rest. 4. The right and left auricles of the heart, the right ventricle, and the left sinus venosus, were filled with black blood; but the left ventricle only half filled with the same, and a quantity of the same black blood was also contained in the smaller branches of the arteries proceeding from the left ventricle.

This investigation was followed by a most careful and ingenious inquiry concerning the causes of the symptoms already related. To find out whether or not the entrance of water into the lungs was the cause, or whether water really entered the lungs in these cases or not, he drowned several animals among ink; and by inspecting their bodies, found, that though water really did enter, it was in such small quantity that it could not be supposed capable of producing such violent effects. To ascertain this, however, more exactly than could be done by the ink, he drowned other animals in quicksilver; which, by reason of its not being miscible with the animal fluids, could be more accurately collected. By these it appeared that no more than five drachms of the fluid in which a cat was immersed entered her lungs in the time of drowning; and to determine whether or not this could be the occasion of the animal's death, he made the following experiment: Having confined a cat in an erect posture, he made a small opening in the trachea, by cutting one of the cartilaginous rings; and through this opening he introduced two ounces of water into the lungs. The only consequences were a difficulty of breathing and weak pulse; but these soon abated, and it lived several hours afterwards without any apparent inconvenience. On strangling it he found two ounces and a half of water in the lungs. On repeating the experiment with other fluids, he found the difficulty of breathing and alteration in the pulse somewhat greater: but in these instances also they abated in a few hours; and when the animals were strangled, the lungs were found to contain four ounces of fluid.

From all these experiments Dr Goodwyn draws the following conclusions: 1. "A small quantity of fluid usually passes into the lungs in drowning. 2. This water enters the lungs during the efforts to inspire; and mixing with the pulmonary mucus, occasions the frothy appearance mentioned by authors. 3. The whole of this fluid in the lungs is not sufficient to produce the changes that take place in drowning. And hence it follows, that the water produces all the changes that take place in drowning *indirectly*, by excluding the atmospheric air from the lungs." This naturally leads to an investigation of the uses of respiration, and the effects of the air upon the blood and lungs in that

action, which our author traces with great accuracy Drowning. and very convincing experiments. He begins with attempting to determine the quantity of air drawn in at each inspiration, with the proportional quantity left after expiration. The experiments by which he endeavoured to ascertain these quantities seem to be more uncertain than the others, as indeed there are not data sufficient for them. From such as he had an opportunity of making, however, the following conclusions were deduced: 1. "The lungs contain 109 cubic inches of air after a complete expiration; and this quantity receives an additional quantity of 14 cubic inches during each inspiration. 2. The dilatation of the lungs after expiration is to their dilatation after inspiration as 109 to 123. 3. The blood circulates through the pulmonary vessels in all the degrees of natural respiration. 4. The circulation through them, after expiration, is sufficiently free to keep up the health of the system."

The last part of our author's inquiry, *viz.* concerning the chemical changes produced in the air by respiration, and the effects of the air upon the blood itself, falls naturally to be considered under the article RESPIRATION: so that here we shall only observe in general, that his experiments evidently show that the disease produced by drowning arises entirely from the exclusion of the atmospheric air or its dephlogisticated part; for which reason he recommends inflating the lungs with that kind of air in preference to any other.

From these different views of this matter, physicians have differed considerably in their account of the methods to be followed in attempting the recovery of drowned persons. De Haen recommends agitation of all kinds; every kind of stimulus applied to the mouth, nose, and rectum; bleeding; heat, both by warm cloths and warm water; blowing air into the trachea; stimulants, such as blisters, warm ashes, &c. applied to the head, ankles, thighs, pit of the stomach, and other parts.

Doctor Cullen's observations on this subject are as follow.—"With respect to the particular means to be employed for the recovery of drowned persons, it is to be observed, in the first place, That such as were recommended and practised, upon a supposition that the suffocation was occasioned by the quantity of water taken into the body, and therefore to be evacuated again, were very unhappily advised. The hanging up of persons by the heels, or setting them upon the crown of the head, or rolling the body upon a cask, were generally practised, upon a supposition altogether false; or upon the supposition of a case which, if real, is apprehended to be irrecoverable. At the same time, these practices were always attended with the danger of bursting some vessels in the brain or lungs, and of rendering thereby some cases incurable that were not so from the drowning alone. All such practices, therefore, are now very properly disapproved of and forbid.

"In those cases in which the body has not been long in the water, and in which therefore the natural heat is not entirely extinguished, nor the irritability of the moving fibres very greatly impaired, it is possible that a good deal of agitation of the body may be the only means necessary to restore the action of the vital organs;

Drowning. gans; but in other cases, where the heat and irritability have ceased to a greater degree, it is to me very doubtful, if much agitation can be safe, and if any degree of it can be useful, till the heat and irritability are in some measure restored. In all cases, any violent concussion cannot be safe, and, I believe, is never necessary. It may be proper here to observe also, that in transporting the body from the place where it is taken out of the water, to the place where it may be necessary for applying the proper means of its recovery, all postures exposing to any improper compression, as that of the body's being carried over a man's shoulder, are to be avoided. The body is to be kept stretched out, with the head and upper parts a little raised; and care is to be taken to avoid the neck's being bent much forward. In this manner, laid upon one side, and upon some straw in a cart, it may be most properly conveyed; and the agitation which a pretty brisk motion of the cart may occasion, will, in most cases, do no harm.

"From the account I have given above of the causes, or of the appearances, of death, in drowned persons, it is evident, that the first step to be taken for their recovery is to restore the heat of the body, which is absolutely necessary to the activity of the moving fibres. For this purpose, the body, as soon as possible, is to be stripped of its wet clothes, to be well dried, and to be wrapped up in dry, and (if possible) warm, coverings: and it is to be wished, in all cases, as soon as the report of a person's being drowned is heard, that blankets should be immediately carried to the water-side; so that, as soon as the body is got out of the water, the change of covering just now mentioned may be instantly made; or, if the body has been naked when drowned, that it may be immediately dried, and defended against the cold of the air. Besides covering the body with blankets, it will be further of advantage, if it can be done without loss of time, to cover the drowned body with a warm shirt or waistcoat immediately taken from a living person.

"When, at the time of a person's being drowned, it happens that the sun shines out very hot, I think there can be no better means of recovering the heat, than by exposing the naked body, in every part, to the heat of the sun; while, at the same time, all other means necessary or useful for the recovery of life are also employed.

"When the heat of the sun cannot be employed, the body should be immediately transported to the nearest house that can be got convenient for the purpose: the fittest will be one that has a tolerably large chamber, in which a fire is ready, or can be made; and if possible, the house should afford another chamber, in which also a fire can be provided.

"When the drowned body is brought into such house, and care is at the same time taken that no more people are admitted than are absolutely necessary to the service of the drowned person, every endeavour must be immediately employed for recovering the heat of the body, and that by different measures, as circumstances shall direct.

"If, in the neighbourhood of the place, there be any brewery, distillery, dyery, or fabric which gives an opportunity of immediately obtaining a quantity of

warm water and a convenient vessel, there is nothing Drowning. more proper than immersing the body in a warm bath. Even where a sufficient quantity of warm water cannot be had at once, the bath may be still practised, if the accident has happened in or very near a town or village, when a great many fires may be at once employed in heating small quantities of water; for in this way the necessary quantity may be soon obtained. To encourage this practice, it is to be observed, that one part of boiling water is more than sufficient to give the necessary heat to two parts of spring or sea water, as it is not proper to apply the bath at first very warm, nor even of the ordinary heat of the human body, but somewhat under it; and, by the addition of warm water, to bring it gradually to a heat very little above it.

"If the drowned body be of no great bulk, it may be conveniently warmed by a person's lying down in bed with it, and taking it near to their naked body, changing the position of it frequently, and at the same time chaffing and rubbing with warm cloths the parts which are not immediately applied to their warm body.

"If none of these measures can be conveniently practised, the body is to be laid upon a bed before a moderate fire, and frequently turned, to expose the different parts of it; and thus, by the heat of the fire gradually applied, and by rubbing the body well with coarse towels, or other cloths well warmed, pains are to be taken for restoring its heat. This will be promoted by warm cloths applied and frequently renewed under the hams and arm-pits; and by hot bricks, or bottles of warm water, laid to the feet.

"In the practice of rubbing, it has been proposed to moisten the cloths applied with camphorated spirits, or other such stimulating substances: but I think this must prove an impediment to the rubbing; and I would not recommend any practice of this kind, except, perhaps, the application of the vinous spirit of sal ammoniac to the wrists and ankles only.

"For recovering the heat of the body, it has been proposed to cover it all over with warm grains, ashes, sand, or salt; and where these, sufficiently warm, are ready at hand, they may be employed; but it is very seldom they can be obtained, and the application might often interfere with other measures that may be necessary. All therefore that I can propose, with respect to the use of these, is to observe, that bags of warm and dry salt may be amongst the most convenient applications to the feet and hands of drowned persons; and the quantity necessary for this purpose may be got pretty quickly by heating the salt in a frying-pan over a common fire.

"While these measures are taking for recovering the heat, means are at the same time to be employed for restoring the action of the moving fibres. It is well known, that the intestines are the parts of the body which, both from their internal situation and peculiar constitution, retain the longest their irritability; and therefore, that, in drowned persons, stimulants applied may have more effect upon the intestines than upon other parts. The action, therefore, of the intestines is to be supported or renewed as soon as possible; as the restoring and supporting the action of such a con-

Drowning. siderable portion of moving fibres as those of the intestines, must contribute greatly to restore the activity of the whole system.

"For exciting the action of the intestines, the most proper mean is, the application of their ordinary stimulus of dilatation; and this is most effectually applied, by forcing a quantity of the air into them by the fundament. Even the throwing in cold air has been found useful: but it will certainly be better if heated air can be employed; and further, if that air can be impregnated with something which, by its acrimony also, may be powerful in stimulating the intestines.

"From all these considerations, the smoke of burning tobacco has been most commonly applied, and has upon many occasions proved very effectual. This will be most properly thrown in by a particular apparatus, which, for other purposes as well as this, should be in the hands of every surgeon; or at least should, at the public expence, be at hand in every part of the country where drownings are likely to happen. With regard to the use of it, I have to observe, that till the tobacco is kindled in a considerable quantity, a great deal of cold air is blown through the box and tube; and as that, as hinted above, is not so proper, care should be taken to have the tobacco very well kindled, and to blow through it very gently, till the heated smoke only passes through. If, upon certain occasions, the apparatus referred to should not be at hand, the measure however may be executed by a common tobacco pipe, in the following manner: A common glyster-pipe that has a bag mounted upon it, is to be introduced into the fundament, and the mouth of the bag is to be applied round the small end of a tobacco-pipe. In the bowl of this, tobacco is to be kindled; and, either by a playing card made into a tube and applied round the mouth of the bowl, or by applying upon this the bowl of another pipe that is empty, and blowing through it, the smoke may be thus forced into the intestines, and, in a little time, in a considerable quantity.

"If none of these means for throwing in the smoke can be employed, it may be useful to inject warm water to the quantity of three or four English pints. This may be done by a common glyster-bag and pipe, but better by a large syringe; and it may be useful to dissolve in the water some common salt, in the proportion of half an ounce to an English pint; and also, to add to it some wine or brandy.

"While these measures for recovering the heat of the body and the activity of the moving fibres are employed, and especially after they have been employed for some time, pains are to be taken to complete and finish the business, by restoring the action of the lungs and heart.

"On this subject, I am obliged to my learned and ingenious colleague Dr. Monro, who has made some experiments for ascertaining the best manner of inflating the lungs of drowned persons. By these experiments he finds it may be more conveniently done by blowing into one of the nostrils, than by blowing into the mouth. For blowing into the nostril, it is necessary to be provided with a wooden pipe, fitted at one extremity for filling the nostril, and at the other for being blown into by a person's mouth, or for receiving the pipe of a pair of bellows, to be employed for the

same purpose. Doctor Monro finds, that a person of ordinary strength can blow into such a pipe, with a sufficient force to inflate the lungs to a considerable degree; and thinks the warm air from the lungs of a living person will be most conveniently employed at first; but when it is not soon effectual in restoring the respiration of the drowned person, and that a longer continuance of the inflation is necessary, it may be proper to employ a pair of bellows, large enough at once to contain the quantity of air necessary to inflate the lungs to a due degree.

"Whether the blowing-in is done by a person's mouth, or by bellows, Dr. Monro observes, that the air is ready to pass by the gullet into the stomach; but that this may be prevented, by pressing the lower part of the larynx backwards upon the gullet. To persons of a little knowledge in anatomy, it is to be observed, that the pressure should be only upon the cricoid cartilage, by which the gullet may be straitened, while the passage through the larynx is not interrupted.

"When, by blowing thus into the nostril, it can be perceived, by the raising of the chest or belly, that the lungs are filled with air, the blowing in should cease; and by pressing the breast and belly, the air received into the lungs should be again expelled; then the blowing and expulsion should be again repeated; and thus the practice is to be continued, so as to imitate, as exactly as possible, the alternate motions of natural respiration.

"It is hardly necessary to observe, that when the blowing into the nostril is practised, the other nostril and the mouth should be accurately closed.

"If it should happen that in this practice the air does not seem to pass readily into the lungs, Doctor Monro informs me it is very practicable to introduce directly into the glottis and trachea a crooked tube, such as the catheter used for a male adult. For this he offers the following directions: The surgeon should place himself on the right side of the patient; and, introducing the forefinger of his left hand at the right corner of the patient's mouth, he should push the point of it behind the epiglottis; and using this as a directory, he may enter the catheter, which he holds in his right hand, at the left corner of the patient's mouth, till the end of it is passed beyond the point of his forefinger; and it is then to be let fall, rather than pushed into the glottis; and through this tube, by a proper syringe applied to it, air may be with certainty blown into the lungs. I observe, that some such measure had been proposed by Mons. le Cat in France; but I have not learned that it has ever been put in practice, and I am afraid it may be attended with several difficulties, and must be left to the discretion of surgeons, who may be properly provided and instructed for this purpose.

"For throwing air with more certainty into the lungs, it has been proposed to open the windpipe in the same manner as is done in the operation which the surgeons call *bronchotomy*, and by this opening to blow into the lungs; and when the blowing into the nostril does not seem to succeed, and a skilful operator is at hand, I allow that the measure may be tried; but I can hardly suppose, that it will be of any advantage when the blowing in by the nostril has entirely failed.

"It is to be hoped, that by blowing into the lungs one way or other, even a quantity of water which had been

Drowning. been taken into the lungs may be again washed out; and the same seems to be the only effectual means of washing out that frothy matter which is found to fill the lungs of drowned persons, and which proves, if I mistake not, the most common cause of their mortal suffocation. This practice, therefore, is to be immediately entered upon, and very assiduously continued for an hour or two together.

"I have now mentioned the measures chiefly to be pursued and depended upon for the recovery of drowned persons; but must still mention some others that may prove considerable helps to it.

"One of these is, the opening the jugular veins to relieve the congestion, which almost constantly occurs in the veins of the head, and is probably a frequent cause of the death of drowned persons. For relieving this congestion, the drawing some blood from the jugulars, very early, may certainly be of service; and it will be particularly indicated by the livid and purple colour of the face. It may even be repeated, according to the effect it seems to have in taking off that suffusion; but when the drowned person is in some measure recovered, and some motion of the blood is restored, it will be proper to be very cautious in making this evacuation, and at least to take care not to push it so far as to weaken too much the recovering, but still weak, powers of life.

"Another measure for recovering the activity of the vital principle, is the application of certain stimulants to the more sensible parts of the body, such as holding the quick-lime spirit of sal ammoniac to the nose, or putting a little of it upon a rag into the nostrils. It has been usual to pour some liquids into the mouth; but it is dangerous to pour in any quantity of liquid, till it appear that the power of swallowing is in some measure restored.

"When a surgeon is at hand, and is provided with proper apparatus, a crooked pipe may be introduced into the gullet; and by this a gill or two of warm wine may be poured down into the stomach, and probably with advantage. But when no such apparatus is at hand, or surgeon to employ it, and the power of swallowing is still doubtful, the trial of pouring liquids into the mouth should be made by a small quantity of warm water alone; and when, from such trial, the power of swallowing shall appear to be recovered, it may then be allowable to favour the further recovery of the person, by pouring in some wine or brandy.—In short, till some marks of the recovery of swallowing and respiration appear, it will not be safe to apply any stimulants to the mouth; excepting that of a few drops of some acrid substance to the tongue, and which are not of bulk enough to slide back upon the glottis: I can think of no stimulant more conveniently and safely to be applied to the mouth and nostrils, than a moderate quantity of tobacco-smoke blown into them.

"Though I do not imagine that drowned persons are ever hurt by the quantity of water taken into their stomach, yet, as a stimulus applied to the stomach, and particularly as the action of vomiting proves a stimulus to the whole system, I can have no objection to the French practice of throwing in an emetic as soon as any swallowing is restored. For this purpose, I would successively throw in some tea-spoonfuls

of the ipecacuanha wine; and when it does not interfere with other necessary measures, the fauces may be gently irritated by an oiled feather thrust into them.

"With regard to the stimulants, I must conclude with observing, That when a body has lain but for a short time in the water, and that therefore its heat and irritability are but little impaired, the application of stimulants alone has been often found effectual for the recovery: but, on the contrary, when the body has lain long in the water, and the heat of it is very much extinguished, the application of any other stimulants than that of tobacco-smoke to the intestines can be of very little service; and the application of others ought never to interfere with the measures for recovering heat and the motion of respiration.

"With respect to the whole of these practices, I expect, from the principles upon which they are in general recommended, it will be understood, that they are not to be soon discontinued, though their effects do not immediately appear. It is obvious, that, in many cases, it may be long before the heat of the body, and the activity of the vital principle, can be restored, although, in a longer time, it may very possibly be accomplished. In fact, it has often happened, that those means employed for one hour have not succeeded, the same continued for two or more hours, have at length had the wished for effects. It should therefore be a constant rule, in this business, that the proper means should be employed for several hours together; unless it happen, that, while no symptoms of returning life appear, the symptoms of death shall, at the same time, go on constantly increasing.

"In the whole of the above I have kept in view chiefly the case of drowned persons: but it will be obvious, that many of the measures proposed will be equally proper and applicable in other cases of suffocation; as those from strangling, the damps of mines, the fumes of charcoal, &c.; and a little attention to the difference of circumstances will lead to the measures most proper to be employed."

Mr Hunter, in the before-mentioned paper, differs pretty considerably from De Haen and Dr Cullen. He observes, that when assistance is soon called in after immersion, blowing air into the lungs will in some cases effect a recovery; but when any considerable time has been lost, he advises stimulant medicines, such as the vapour of volatile alkali, to be mixed with the air; which may easily be done, by holding spirits of hartshorn in a cup under the receiver of the bellows. And, as applications of this kind to the olfactory nerves tend greatly to rouse the living principle, and put the muscles of respiration into action, it may probably, therefore, be most proper to have air impregnated in that manner thrown in by the nose. To prevent the stomach and intestines from being too much distended by the air so injected, the larynx is directed to be gently pressed against the œsophagus and spine.

While this business is going on, an assistant should prepare bed-cloaths, carefully brought to a proper degree of heat. Heat our author considers as congenial with the living principle; increasing the necessity of action, it increases action; cold, on the other hand, lessens the necessity, and of course the action is diminished: to a due degree of heat, therefore, the living principle,

Drowning. principle, he thinks, owes its vigour. From experiments, he says, it appears to be a law in animal bodies, that the degree of heat should bear a proportion to the quantity of life; as life is weakened, this proportion requires great accuracy, while greater powers of life allow it greater latitudes.

After these and several other observations on the same subject, our author proceeds to more particular directions for the management of drowned people.

If bed-cloaths are put over the person, so as scarce to touch him, steams of volatile alkali, or of warm balsams, may be thrown in, so as to come in contact with many parts of the body. And it might probably be advantageous, Mr Hunter observes, to have steams of the same kind conveyed into the stomach. This, we are told, may be done by a hollow bougie and a syringe; but the operation should be very speedily performed, as the instrument, by continuing long in the mouth, might produce sickness, which our author says he would always wish to avoid.

Some of the warm stimulating substances, such as juice of horse-radish, peppermint water, and spirits of hartshorn, are directed to be thrown into the stomach in a fluid state, as also to be injected by the anus. Motion possibly may be of service; it may at least be tried: but as it hath less effect than any other of the usually prescribed stimuli, it is directed to be the last part of the process.

The same care in the operator, in regulating the proportion of every one of these means, is here directed, as was formerly given for the application of heat. For every one of them, our author observes, may possibly have the same property of destroying entirely the feeble action which they have excited, if administered in too great a quantity: instead, therefore, of increasing and hastening the operations on the first signs of returning life being observed, as is usually done, he desires they may be lessened; and advises their increase to be afterwards proportioned, as nearly as possible, to the quantity of powers as they arise.

When the heart begins to move, the application of air to the lungs should be lessened, that, when the muscles of respiration begin to act, a good deal may be left for them to do.

Mr Hunter absolutely forbids blood-letting in all such cases; for, as it not only weakens the animal principle, but lessens life itself, it must consequently, he observes, lessen both the powers and dispositions to action. For the same reason, he is against introducing any thing into the stomach that might produce sickness or vomiting; and, on the same principle, he says, we should avoid throwing tobacco fumes, or any other such articles, up by the anus, as might tend to an evacuation that way.

The following is a description of instruments recommended for such operations by our author.

First, A pair of bellows, so contrived, with two separate cavities, that, by opening them when applied to the nostrils or mouth of a patient, one cavity will be filled with common air, and the other with air sucked out from the lungs, and by shutting them again, the common air will be thrown into the lungs, and that sucked out of the lungs discharged into the room. The pipe of these should be flexible; in length a foot, or a foot and an half; and, at least, three eighths of an inch

in width. By this the artificial breathing may be continued, while the other operations, the application of the stimuli to the stomach excepted, are going on; which could not be conveniently done if the muzzle of the bellows were introduced into the nose. The end next the nose should be double, and applied to both nostrils. *Secondly*, A syringe, with a hollow bougie, or flexible catheter, of sufficient length to go into the stomach, and convey any stimulating matter into it, without affecting the lungs. *Thirdly*, A pair of small bellows, such as are commonly used in throwing fumes of tobacco up by the anus.

Notwithstanding the differences in theory, however, between the physicians above mentioned, it is certain, that within these few years great numbers of drowned people have been restored to life by a proper use of the remedies we have enumerated, and societies for the recovery of drowned persons have been instituted in different places. The first society of this kind was instituted in Holland, where, from the great abundance of canals and inland seas, the inhabitants are particularly exposed to accidents by water. In a very few years 150 persons were saved from death by this society; and many of these had continued upwards of an hour without any signs of life, after they had been taken out of the water. The society was instituted at Amsterdam in 1767: and, by an advertisement, informed the inhabitants of the United Provinces of the methods proper to be used on such occasions; offering rewards at the same time to those who should, with or without success, use those methods for recovering persons drowned and seemingly dead. The laudable and humane example of the Dutch was followed in the year 1768 by the magistrates of health in Milan and Venice; afterwards by the magistrates of Hamburg in the year 1771, by those of Paris in the year 1772, and by the magistrates of London in 1774.

The following directions are given for the recovery of drowned persons by the society at London.

I. As soon as the patient is taken out of the water, the wet cloaths, if the person is not naked at the time of the accident, should be taken off with all possible expedition on the spot (unless some convenient house be very near), and a great-coat or two, or some blankets if convenient, should be wrapped round the body.

II. The patient is to be thus carefully conveyed in the arms of three or four men, or on a bier, to the nearest public or other house, where a good fire, if in the winter season, and a warm bed, can be made ready for its reception. As the body is conveying to this place, great attention is to be paid to the position of the head; it must be kept supported in a natural and easy posture, and not suffered to hang down.

III. In cold or moist weather, the patient is to be laid on a matras or bed before the fire, but not too near, or in a moderately heated room: in warm and sultry weather, on a bed only. The body is then to be wrapped as expeditiously as possible with a blanket, and thoroughly dried with warm coarse cloths or flannels.

IV. In summer or sultry weather too much air cannot be admitted. For this reason it will be necessary to set open the windows and doors, as cool refreshing air is of the greatest importance in the process of resuscitation.

V. Not

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V. Not more than six persons are to be present to apply the proper means; a greater number will be useless, and may retard, or totally prevent, the restoration of life, by rendering the air of the apartment unwholesome. It will be necessary, therefore, to request the absence of those who attend merely from motives of curiosity.

VI. It will be proper for one of the assistants, with a pair of bellows of the common size, applying the pipe a little way up one nostril, to blow with some force, in order to introduce air into the lungs; at the same time the other nostril and the mouth are to be closed by another assistant, whilst a third person gently presses the chest with his hands, after the lungs are observed to be inflated. By pursuing this process, the noxious and stagnant vapours will be expelled, and natural breathing imitated. If the pipe of the bellows be too large, the air may be blown in at the mouth, the nostrils at the same time being closed, so that it may not escape that way: but the lungs are more easily filled, and natural breathing better imitated, by blowing up the nostril.

VII. Let the body be gently rubbed with common salt, or with flannels, sprinkled with spirits, as rum or geneva (A). A warming-pan heated (the body being surrounded with flannel) may be lightly moved up and down the back. Fomentations of hot brandy are to be applied to the pit of the stomach, loins, &c. and often renewed. Bottles filled with hot water, heated tiles covered with flannel, or hot bricks, may be efficaciously applied to the soles of the feet, palms of the hands, and other parts of the body. The temples may be rubbed with spirits of hartshorn, and the nostrils now and then tickled with a feather; and snuff, or *eau de luce*, should be occasionally applied.

VIII. Tobacco fumes should be thrown up the fundament; if a fumigator be not at hand, the common pipe may answer the purpose. The operation should be frequently performed, as it is of importance; for the good effects of this process have been experienced in a variety of instances of suspended animation. But should the application of tobacco-smoke in this way not be immediately convenient, or other impediments arise, clysters of this herb, or other acrid infusions with salt, &c. may be thrown up with advantage.

IX. When these means have been employed a considerable time without success, and any brewhouse or warm bath can be readily obtained, the body should be carefully conveyed to such a place, and remain in the bath, or surrounded with warm grains, for three or four hours.

If a child has been drowned, its body should be wiped perfectly dry, and immediately placed in bed between two healthy persons. The salutary effects of the natural vital warmth, conveyed in this manner, have been proved in a variety of successful cases.

X. While the various methods of treatment are employed, the body is to be well shaken every ten minutes, in order to render the process of animation more certainly successful; and children, in particular, are to be much agitated, by taking hold of their legs and

arms frequently and for a continuance of time. In various instances agitation has forwarded the recovery of boys who have been drowned, and continued for a considerable time apparently dead.

XI. If there be any signs of returning life, such as sighing, gasping, or convulsive motions, a spoonful of any warm liquid may be administered; and if the act of swallowing is returned, then a cordial of warm brandy or wine may be given in small quantities and frequently repeated.

XII. Electricity may be tried by the judicious and skilful, as its application neither prevents nor retards the various modes of recovery already recommended; but, on the other hand, will most probably tend to render the other means employed more certainly and more expeditiously efficacious. This stimulus bids fair to prove an important auxiliary in cases of suspended animations; and therefore deserves the serious regard and attention of the Faculty.

The methods which have been fully described, are to be employed with vigour for three hours or upwards, although no favourable circumstances should arise; for it is a vulgar and dangerous opinion to suppose that persons are irrecoverable, because life does not soon make its appearance; an opinion that has consigned to the grave an immense number of the seemingly dead, who might have been restored to life by resolution and perseverance.

Bleeding is never to be employed in such cases, unless by the direction of one of the medical assistants, or some other gentleman of the faculty who has paid attention to the resuscitating art.

DRUG, a general term for goods of the druggist and grocery kinds, especially those used in medicine and dyeing. See MATERIA MEDICA, PHARMACY, and DYEING.

DRUGGET, in commerce, a stuff sometimes all wool, and sometimes half wool half thread, sometimes corded, but usually plain. Those that have the woof of wool, and the warp of thread, are called *threaded druggets*; and those wrought with the shuttle on a loom of four marches, as the serges of Moui, Beauvois, and other like stuffs corded, are called *corded druggets*. As to the plain, they are wrought on a loom of two marches, with the shuttle, in the same manner as cloth, camblets, and other like stuffs not corded.

DRUIDÆ, or DROIVM (anc. geog.), a very ancient town, the principal place of the Druides or Druidæ in Gaul, as they are called (Cæsar, Cicero). Now *Dreux* in the Orleanois. Here they met every year in a consecrated grove, according to Cæsar. The town was also called *Durocasæ*. W. Long. 1. 21. Lat. 48. 45.

DRUIDS, DRUIDES, or DRUIDÆ, the priests or ministers of religion among the ancient Celtæ or Gauls, Britons, and Germans.

Some authors derive the word from the Hebrew דרוש *derussim*, or *drussim*, which they translate *contemplatores*. Picard, *Celtopæd.* lib. ii. p. 58. believes the druids to have been thus called from *Druis*, or *Dryius*, their leader, the fourth or fifth king of the Gauls,

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Druids.

(A) Dr Fothergill of Bath, in a letter to the Register, advises as a potent and active stimulus the patent mustard moistened with spirits.

Druids.

Gauls, and father of Saron or Naumes. Pliny, Salmasius, Vigenere, &c. derive the name from *δρυς*, oak; on account of their inhabiting, or at least frequenting, and teaching in forests; or perhaps because, as Pliny says, they never sacrificed but under the oak. But it is hard to imagine how the druids should come to speak Greek. Menage derives the word from the old British *drys*, "dæmon, magician." Borel, from the Saxon *dry*, "magician;" or rather from the old British *dru*, or *deraw*, "oak," whence he takes *δρυς* to be derived; which is the most probable supposition. Gorop. Becanus, lib. i. takes *druis* to be an old Celtic and German word, formed from *truwis* or *truwis*, "a doctor of the truth and the faith;" which etymology Vossius acquiesces in.

General account of the druids.

The druids were the first and most distinguished order among the Gauls and Britons; they were chosen out of the best families; and the honours of their birth, joined with those of their function, procured them the highest veneration among the people. They were versed in astrology, geometry, natural philosophy, politics, and geography; they were the interpreters of religion, and the judges of all affairs indifferently. Whoever refused obedience to them was declared impious and accursed. We know but little as to their peculiar doctrines; only that they believed the immortality of the soul; and, as is generally also supposed, the metempsychosis; though a late author makes it appear highly probable they did not believe this last, at least not in the sense of the Pythagoreans.

The chief settlement of the druids in Britain was in the isle of Anglesey, the ancient *Mona*, which they might choose for this purpose, as it is well stored with spacious groves of their favourite oak. They were divided into several classes or branches, viz. the *vacerri*, *bardi*, *eubages*, *semnothii* or *semnothi*, and *saronide*. The *vacerri* are held to have been the priests; the *bardi*, the poets; the *eubages*, the augurs; and the *saronide*, the civil judges and instructors of youth. As to the *semnothi*, who are said to have been immediately devoted to the service of religion, it is probable they were the same with the *vacerri*. Strabo, however, (lib. iv. p. 197.) and Picard after him in his *Celtopædia*, do not comprehend all these different orders under the denomination of druids, as species under their genus, or parts under the whole; but make them quite different conditions or orders. Strabo, in effect, only distinguishes three kinds; *bardi*, *vates*, and *druis*. The *bardi* were the poets; the *vates*, *uatis* (apparently the same with the *vacerri*), were the priests and naturalists; and the *druis*, beside the study of nature, applied themselves likewise to morality.

Diogenes Laertius assures us, in his Prologue, that the druids were the same among the ancient Britons with the sophi or philosophers among the Greeks; the magi among the Persians; the gymnosophists among the Indians; and the Chaldeans among the Assyrians.

Their garments were remarkably long; and, when employed in religious ceremonies, they always wore a white surplice. They generally carried a wand in their hands; and wore a kind of ornament enchased in gold about their necks, called the *druid's egg*. Their necks were likewise decorated with gold chains, and their

hands and arms with bracelets: they wore their hair very short, and their beards remarkably long.

Druids.

The druids had one chief, or arch-druid, in every nation, who acted as high-priest, or *pontifex maximus*. He had absolute authority over the rest; and commanded, decreed, punished, &c. at pleasure. At his death he was succeeded by the most considerable among his survivors; and, if there were several pretenders, the matter was ended by an election, or else put to the decision of arms.

The druids, we have observed, were in the highest esteem. They presided at sacrifices, and other ceremonies; and had the direction of every thing relating to religion. The British and Gaulish youth flocked to them in crowds, to be instructed by them. The children of the nobility, Mela tells us, they retired with into caves, or the most desolate parts of forests, and kept them there sometimes for twenty years under their discipline. Beside the immortality and metempsychosis, they were here instructed in the motion of the heavens, and the course of the stars; the magnitude of the heavens and the earth; the nature of things; the power and wisdom of the gods, &c. They preserved the memory and actions of great men in their verses, which they never allowed to be wrote down, but made their pupils get them by heart. In their common course of learning, they are said to have taught them twenty-four thousand such verses. By this means their doctrines appeared more mysterious by being unknown to all but themselves; and having no books to recur to, they were the more careful to fix them in their memory.

They worshipped the Supreme Being under the name of *Efus*, or *Hesus*, and the symbol of the oak; and had no other temple than a wood or a grove, where all their religious rites were performed. Nor was any person admitted to enter that sacred recess, unless he carried with him a chain, in token of his absolute dependence on the Deity. Indeed, their whole religion originally consisted in acknowledging, that the Supreme Being, who made his abode in these sacred groves, governed the universe; and that every creature ought to obey his laws, and pay him divine homage.

They considered the oak as the emblem, or rather the peculiar residence, of the Almighty; and accordingly chaplets of it were worn both by the druids and people in their religious ceremonies, the altars were strewed with its leaves and encircled with its branches. The fruit of it, especially the mistletoe, was thought to contain a divine virtue, and to be the peculiar gift of heaven. It was therefore sought for on the sixth day of the moon with the greatest earnestness and anxiety; and when found was hailed with such raptures of joy, as almost exceeds imagination to conceive. As soon as the druids were informed of this fortunate discovery, they prepared every thing ready for the sacrifice under the oak, to which they fastened two white bulls by the horns; then the arch-druid, attended by a prodigious number of people, ascended the tree, dressed in white; and with a consecrated golden knife, or pruning hook, cropped the mistletoe, which he received in his sagum or robe, amidst the rapturous exclamations of the people. Having se-

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Druids.

cured this sacred plant, he descended the tree; the bulls were sacrificed; and the Deity invoked to bless his own gift, and render it efficacious in those distempers in which it should be administered.

The consecrated groves, in which they performed their religious rites, were fenced round with stones, to prevent any person's entering between the trees, except through the passages left open for that purpose, and which were guarded by some inferior druids, to prevent any stranger from intruding into their mysteries. These groves were of different forms; some quite circular, others oblong, and more or less capacious as the votaries in the districts to which they belonged were more or less numerous. The area in the centre of the grove was encompassed with several rows of large oaks set very close together. Within this large circle were several smaller ones surrounded with large stones; and near the centre of these smaller circles, were stones of a prodigious size and convenient height, on which the victims were slain and offered. Each of these being a kind of altar, was surrounded with another row of stones, the use of which cannot now be known, unless they were intended as cinctures to keep the people at a convenient distance from the officiating priest.

Suetonius, in his life of Claudius, assures us the druids sacrificed men; and Mercury is said to be the god to whom they offered these victims. Diod. Siculus, lib. vi. observes it was only upon extraordinary occasions they made such offerings; as, to consult what measures to take, to learn what should befall them, &c. by the fall of the victim, the tearing of his members, and the manner of his blood gushing out. Augustus condemned the custom, and Tiberius and Claudius punished and abolished it.

We learn from Cæsar, that the druids were the judges and arbiters of all differences and disputes, both public and private: they took cognizance of murders, inheritances, boundaries, and limits; and decreed rewards and punishments. Such as disobeyed their decisions they excommunicated, which was their principal punishment; the criminal being hereby excluded from all public assemblies, and avoided by all the world; so that nobody durst speak to him for fear of being polluted. Strabo observes, they had sometimes interest and authority enough to stop armies upon the point of engaging, and accommodate their differences.

2
Their opinions and philosophy, whence derived.

It hath been disputed, whether the druids were themselves the inventors of their opinions and systems of religion and philosophy, or received them from others. Some have imagined, that the colony of Phocians which left Greece and built Marseilles in Gaul about the 57th Olympiad, imported the first principles of learning and philosophy, and communicated them to the Gauls and other nations in the west of Europe. It appears, indeed, that this famous colony contributed not a little to the improvement of that part of Gaul where it settled, and to the civilization of its inhabitants. "The Greek colony of Marseilles (says Justin) civilized the Gauls, and taught them to live under laws; to build cities and inclose them with walls; to raise corn; to cultivate the vine and olive; and, in a word, made so great a change both in the face of the country and the manners of its inhabitants, that Gaul seemed to be translated into Greece, rather than a few

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Greeks transplanted into Gaul." But though we may allow that the druids of Gaul and Britain borrowed some hints and embellishments of their philosophy from this Greek colony, and perhaps from other quarters, we have reason to believe that the substance of it was their own. Others have suggested, that the druids derived their philosophy from Pythagoras, who published his doctrines at Crotona in Italy; where he lived in the highest reputation for his virtue, wisdom, and learning, above 20 years. This conjecture is very much confirmed by this remarkable expression of Ammianus Marcellinus, "That the druids were formed into fraternities, as the authority of Pythagoras decreed." It hath been also observed, that the philosophy of the druids bore a much greater resemblance to that of Pythagoras than to that of any of the other sages of antiquity. But it seems probable, that Ammianus meant no more by the above expression than to illustrate the nature of the druidical fraternities, by comparing them to those of the Pythagoreans, which were well known to the Romans; and the resemblance between the Pythagorean and druidical philosophy may perhaps be best accounted for by supposing, that Pythagoras learned and adopted some of the opinions of the druids, as well as imparted to them some of his discoveries. It is well known, that this philosopher, animated by the most ardent love of knowledge, travelled into many countries in pursuit of it, and got himself admitted into every society that was famous for its learning. It is therefore highly probable in itself, as well as directly asserted by several authors, that Pythagoras heard the druids of Gaul, and was initiated into their philosophy.

From the concurring testimonies of several authors, it appears that physiology, or natural philosophy, was the favourite study of the druids of Gaul and Britain. Cicero tells us, that he was personally acquainted with one of the Gaulish druids, Divitiacus the Æduan, a man of quality in his country, who professed to have a thorough knowledge of the laws of nature, or that science which the Greeks call *physics* or *physiology*. According to Diodorus Siculus, Strabo, Cæsar, Mela, Ammianus Marcellinus, and others, they entered into many disquisitions and disputations in their schools, concerning the form and magnitude of the universe in general, and of this earth in particular, and even concerning the most sublime and hidden secrets of nature. On these and the like subjects they formed a variety of systems and hypotheses; which they delivered to their disciples in verse, that they might the more easily retain them in their memories, since they were not allowed to commit them to writing. Strabo hath preserved one of the physiological opinions of the druids concerning the universe; viz. that it was never to be entirely destroyed or annihilated; but was to undergo a succession of great changes and revolutions, which were to be produced sometimes by the power and predominancy of water, and sometimes by that of fire. This opinion, he intimates, was not peculiar to them, but was entertained also by the philosophers of other nations; and Cicero speaks of it as a truth universally acknowledged and undeniable. "It is impossible for us (says he) to attain a glory that is eternal, or even of very long duration, on account of those deluges and conflagrations of the

Druids.

3
More particular account of the learning of the druids.

4
Physics, or natural philosophy.

S

earth

Druids. earth which must necessarily happen at certain periods." This opinion, which was entertained by the most ancient philosophers of many different and very distant nations, was probably neither the result of rational inquiry in all these nations, nor communicated from one of them to others; but descended to them all from their common ancestors of the family of Noah by tradition, but corrupted and misunderstood through length of time. The agreement of the druids with the philosophers of so many other nations in this opinion about the alternate dissolution and renovation of the world, gives us reason to believe, that they agreed with them also in their opinion of its origin from two distinct principles; the one intelligent and omnipotent, which was God; the other inanimate and inactive, which was matter. We are told by Cæsar, that they had many disquisitions about the power of God; and, no doubt, amongst other particulars, about his creating power. But whether they believed with some that matter was eternal, or with others that it was created; and in what manner they endeavoured to account for the disposition of it into the present form of the universe, we are entirely ignorant, though they certainly had their speculations on these subjects. We are only informed, that they did not express their sentiments on these and the like heads in a plain and natural, but in a dark, figurative, and enigmatical manner. This might incline us to suspect, that Pythagoras had borrowed from them his doctrine about numbers, to whose mystical energy he ascribes the formation of all things; for nothing can be more dark and enigmatical than that doctrine. The druids disputed likewise about the magnitude and form of the world in general, and of the earth in particular, of which things they pretended to have a perfect knowledge. We know not what their opinions were about the dimensions of the universe or of the earth, but we have several reasons to make us imagine that they believed both to be of a spherical form. This is visibly the shape and form of the sun, moon, and stars, the most conspicuous parts of the universe; from whence it was natural and easy to infer, that this was the form of the world and of the earth. Accordingly this seems to have been the opinion of the philosophers of all nations; and the circle was the favourite figure of the druids, as appears from the form both of their houses and places of worship. Besides these general speculations about the origin, dissolution, magnitude, and form of the world and of the earth, the druids engaged in particular inquiries into the natures and properties of the different kinds of substances. But all their discoveries in this most useful and extensive branch of natural philosophy, whatever they were, are entirely lost.

Astronomy. Astronomy also appears to have been one of the chief studies of the druids of Gaul and Britain. "The druids (says Cæsar) have many disquisitions concerning the heavenly bodies and their motions, in which they instruct their disciples." Mela, speaking of the same philosophers, observes, "That they profess to have great knowledge of the motions of the heavens and of the stars." Some knowledge of this science indeed was not only necessary for measuring time in general, marking the duration of the different seasons, regulating the operations of the husbandman, directing the course of the mariner, and for

many other purposes in civil life; but it was especially necessary for fixing the times and regular returns of their religious solemnities, of which the druids had the sole direction. Some of these solemnities were monthly, and others annual. It was therefore necessary for them to know, with some tolerable degree of exactness, the number of days in which the sun and moon performed their revolutions, that these solemnities might be observed at their proper seasons. This was the more necessary, as some of these solemnities were attended by persons from different and very distant countries, who were all to meet at one place on one day; who must have had some rule to discover the annual return of that day.

The most perceptible division of time by the two great luminaries is into day and night; the former occasioned by the presence of the sun above the horizon, the latter by his absence, which is in some measure supplied by the moon and stars. The druids computed their time by nights, and not by days; a custom which they had received from their most remote ancestors by tradition, and in which they were confirmed by their measuring their time very much by the moon, the mistress and queen of night. As the changes in the aspect of that luminary are most conspicuous, they engaged the attention of the most ancient astronomers of all countries, and particularly of the druids, who regulated all their great solemnities, both sacred and civil, by the age and aspect of the moon. "When no unexpected accident prevents it, they assemble upon stated days, either at the time of the new or full moon; for they believe these to be the most auspicious times for transacting all affairs of importance." Their most august ceremony of cutting the mistletoe from the oak by the archdruid, was always performed on the sixth day of the moon. Nay, they even regulated their military operations very much by this luminary, and avoided, as much as possible, to engage in battle while the moon was on the wane. As the attention of the druids was so much fixed on this planet, it could not be very long before they discovered that she passed through all her various aspects in about thirty days; and by degrees, and more accurate observations, they would find, that the real time of her performing an entire revolution was very nearly $29\frac{1}{2}$ days. This furnished them with the division of their time into months, or revolutions of the moon; of which we know with certainty they were possessed. But this period, though of great use, was evidently too short for many purposes, and particularly for measuring the seasons; which they could not fail to perceive depended on the influences of the sun. By continued observation they discovered, that about 12 revolutions of the moon included all the variety of seasons, which begun again, and revolved every 12 months. This suggested to them that larger division of time called a year, consisting of 12 lunations, or 354 days, which was the most ancient measure of the year in almost all nations. That this was for some time at least the form of the druidical year, is both probable in itself, and from the following expression of Pliny: "That they begun both their months and years, not from the change, but from the sixth day of the moon." This is even a demonstration that their years consisted of a certain number of lunar revolutions, as they always commenced on the same day

6
Their method of computing time.

Druids. of the moon. But as this year of 12 lunar months falls 11 days and nearly one-fourth of a day short of a real revolution of the sun, this error would soon be perceived, and call for reformation; though we are not informed of the particular manner in which it was rectified. Various arguments might be collected to make it very probable that the Britons were acquainted with a year exact enough for every purpose of life, when they were first invaded by the Romans; but it will be sufficient to mention one, which is taken from the time and circumstances of that invasion. The learned Dr Halley hath demonstrated that Cæsar arrived in Britain, in his first year's expedition, on the 26th day of August: and Cæsar himself informs us, that at his arrival the harvest was finished, except in one field, which by some means or other was more backward than the rest of the country. This is a proof that the British husbandmen knew and used the most proper seasons for ploughing, sowing, and reaping. The druids, as we are told by Pliny, had also a cycle or period of 30 years, which they called an age, and which commenced likewise on the sixth day of the moon; but that author hath not acquainted us on what principles this cycle was formed, nor to what purposes it was applied. We can hardly suppose that this was the cycle of the sun, which consists of 28 years, and regulates the dominical letters. It is more probable, that while the druids made use of the year of 12 lunar months, and had not invented a method of adjusting it to the real revolution of the sun, they observed that the beginning of this year had passed through all the seasons, and returned to the point from whence it set out, in a course of about 33 years; which they might therefore call an age. Others may perhaps be of opinion, that this 30 years cycle of the druids is the same with the great year of the Pythagoreans, or a revolution of Saturn. Some have imagined that the druids were also acquainted with the cycle of 19 years, which is commonly called the cycle of the moon. But the evidence of this depends entirely on the truth of that supposition, that the Hyperborean island, which is described by Diodorus Siculus, was Britain, or some of the British isles. Among many other surprising things, that author says, concerning this Hyperborean island, "That its inhabitants believed that Apollo descended into their island at the end of every 19 years; in which period of time the sun and moon, having performed their various revolutions, return to the same point, and begin to repeat the same revolutions. This is called by the Greeks the great year, or the cycle of Meton."

7
Their
knowledge
of the stars.

We are told both by Cæsar and Mela, that the druids studied the stars as well as the sun and moon; and that they professed to know, and taught their disciples, many things concerning the motions of these heavenly bodies. From these testimonies we may conclude that the druids were acquainted with the planets, distinguished them from the fixed stars, and carefully observed their motions and revolutions. If this discovery was the result of their own observations, it would be gradual, and it would be a long time before they found out all the planets. They might perhaps have received some assistance and information from Pythagoras, or from some other quarter. But whether this discovery of the planets was their own, or communicated to them by others, it is highly probable that

they were acquainted with the precise number of these wandering stars. Dio Cassius says, that the custom of giving the name of one of the planets to each of the seven days of the week was an invention of the Egyptians, and from them was gradually communicated to all the other nations of the world; and that in his time this custom was so firmly established, not only among the Romans, but among all the rest of mankind, that in every country it appeared to be a native institution. The knowledge of the planets, and perhaps the custom of giving their names to the days of the week, was brought out of Egypt into Italy by Pythagoras, more than 500 years before the beginning of the Christian era; and from thence it could not be very long before it reached Gaul and Britain. But though we have little or no reason to doubt that the druids knew the number and observed the motion of the planets, yet it may be questioned whether they had discovered the times in which they performed their several revolutions. Some of these stars, as Jupiter and Saturn, take so great a number of years in revolving, that it required a very extraordinary degree of patience and attention to discover the precise periods of their revolutions. If we could be certain that the island in which the ancients imagined Saturn lay asleep, was one of the British isles, as Plutarch intimates it was, we might be inclined to think that the British druids were not ignorant of the length of the period in which the planet Saturn performs a revolution. For that same author, in another treatise, tells us, "That the inhabitants of that island kept every thirtieth year a solemn festival in honour of Saturn, when his star entered into the sign of Taurus."

If we could depend upon the above testimony of Plutarch, we should have one positive proof that the druids of the British isles were acquainted with the constellations, and even with the signs of the zodiac; and that they measured the revolutions of the sun and planets, by observing the length of time between their departure from and return to one of these signs. But we have no direct evidence of this remaining in history.

The druids of Gaul and Britain, as well as the ancient philosophers of other countries, had a general plan or system of the universe, and of the disposition and arrangement of its various parts, in which they instructed their disciples. This is both probable in itself, and is plainly intimated by several authors of the greatest authority. But we cannot be certain whether this druidical system of the world was of their own invention, or was borrowed from others. If it was borrowed, it was most probably from the Pythagoreans, to whom they were the nearest neighbours, and with whom they had the greatest intercourse.

It hath been imagined, that the druids had instruments of some kind or other, which answered the same purposes with our telescopes, in making observations on the heavenly bodies. The only foundation of this very improbable conjecture is an expression of Diodorus Siculus, in his description of the famous Hyperborean island. They say further, that the moon is seen from that island, as if she was but at a little distance from the earth, and having hills or mountains like ours on her surface. But no such inference can be reasonably drawn from this expression, which in reality merits little more regard than what Strabo re-

Druids. ports was said of some of the inhabitants of Spain :
 "That they heard the hissing noise of the sun every evening when he fell into the western ocean."

The application of the druids to the study of philosophy and astronomy amounts almost to a demonstration that they applied also to the study of arithmetic and geometry. For some knowledge of both these sciences is indispensably necessary to the physiologist and astronomer, as well as of great and daily use in the common affairs of life.

8
Arithmetic

If we were certain that ABARIS, the famous Hyperborean philosopher, the friend and scholar of Pythagoras, was really a British druid, as some have imagined, we should be able to produce direct historical evidence of their arithmetic knowledge. For Iamblicus, in the life of Pythagoras, says, "that he taught Abaris to find out all truth by the science of arithmetic." It may be thought improbable that the druids had made any considerable progress in arithmetic, as this may seem to be impossible by the mere strength of memory without the assistance of figures and of written rules. But it is very difficult to ascertain what may be done by memory alone, when it hath been long exercised in this way. We have had an example in our own age, of a person * who could perform some of the most tedious and difficult operations in arithmetic by the mere strength of his memory. The want of written rules could be no great disadvantage to the druids, as the precepts of this, as well as of the other sciences, were couched in verse, which would be easily got by heart and long remembered. Though the druids were unacquainted with the Arabic characters which are now in use, we have no reason to suppose that they were destitute of marks or characters of some other kind, which, in some measure, answered the same purposes, both in making and recording their calculations. In particular, we have reason to think, that they made use of the letters of the Greek alphabet for both these purposes. This seems to be plainly intimated by Cæsar in the following expression concerning the druids of Gaul: "In almost all other public transactions, and private accounts or computations, they make use of the Greek letters." This is further confirmed by what the same author says of the Helvetii; a people of the same origin, language, and manners, with the Gauls and Britons. "Tables were found in the camp of the Helvetii written in Greek letters, containing an account of all the men capable of bearing arms, who had left their native country, and also separate accounts of the boys, old men, and women." There is historical evidence of the druids being also well acquainted with geometry. "When any disputes arise (says Cæsar) about their inheritances, or any controversies about the limits of their fields, they are entirely referred to the decision of their druids." But besides the knowledge of mensuration which this implies, both Cæsar and Mela plainly intimate that the druids were conversant in the most sublime speculations of geometry; "in measuring the magnitude of the earth, and even of the world."

9
Skill in mechanics.

There are still many monuments remaining in Britain and the adjacent isles, which cannot so reasonably be ascribed to any as to the ancient Britons, and which give us cause to think, that they had made

great progress in this useful part of learning, and could apply the mechanical powers so as to produce very astonishing effects. As these monuments appear to have been designed for religious purposes, we may be certain that they were erected under the direction of the druids. How many obelisks or pillars, of one rough unpolished stone each, are still to be seen in Britain and its isles? Some of these pillars are both very thick and lofty, erected on the summits of barrows and of mountains; and some of them (as at Stonehenge) have ponderous blocks of stone raised aloft, and resting on the tops of the upright pillars. We can hardly suppose that it was possible to cut these prodigious masses of stone (some of them above forty tons in weight) without wedges, or to raise them out of the quarry without levers. But it certainly required still greater knowledge of the mechanical powers, and of the method of applying them, to transport those huge stones from the quarry to the places of their destination; to erect the perpendicular pillars, and to elevate the imposts to the tops of these pillars. If that prodigious stone in the parish of Constantine, Cornwall, was really removed by art from its original place, and fixed where it now stands (as one of our most learned and diligent antiquaries thinks it was †), † *Dr Borlase's Antiquities of Cornwall*, p. 174, 175. it is a demonstration, that the druids could perform the most astonishing feats by their skill in mechanics. That the British druids were acquainted with the principles and use of the balance, we have good reason to believe, not only from the great antiquity of that discovery in other parts of the world, but also from some druidical monuments which are still remaining in this island. These monuments are called *Lagan stones*, or rocking stones; and each of them consists of one prodigious block of stone, resting upon an upright stone or rock, and so equally balanced, that a very small force, sometimes even a child, can move it up and down, though hardly any force is sufficient to remove it from its station. Some of these stones may have fallen into this position by accident, but others of them evidently appear to have been placed in it by art. That the ancient Britons understood the constitution and use of wheels, the great number of their war-chariots and other wheel-carriages is a sufficient proof; and that they knew how to combine them together and with the other mechanical powers, so as to form machines capable of raising and transporting very heavy weights, we have good reason to believe. In a word, if the British druids were wholly ignorant of the principles and use of any of the mechanical powers, it was most probably of the screw, though even of this we cannot be certain.

10
Medicine. In Germany and in the northern nations of Europe the healing art was chiefly committed to the old women of every state; but in Gaul and Britain it was intrusted to the druids, who were the physicians as well as the priests of these countries. Pliny says expressly, "That Tiberius Cæsar destroyed the druids of the Gauls, who were the poets and physicians of that nation;" and he might have added of the Britons. The people of Gaul and Britain were probably induced to devolve the care of their health on the druids, and to apply to these priests for the cure of their diseases, not only by the high esteem they had of their wisdom and learning, but also by the opinion which they entertained,

Druids.

tertaind, that a very intimate connection subsisted between the arts of healing and the rites of religion, and that the former were most effectual when they were accompanied by the latter. It appears indeed to have been the prevailing opinion of all the nations of antiquity, that all internal diseases proceeded immediately from the anger of the gods; and that the only way of obtaining relief from these diseases was by applying to their priests to appease their anger by religious rites and sacrifices. This was evidently the opinion and practice of the Gauls and Britons, who in some dangerous cases sacrificed one man as the most effectual means of curing another. "They are much addicted (says Cæsar) to superstition; and for this cause, those who are afflicted with a dangerous disease sacrifice a man, or promise that they will sacrifice one, for their recovery. For this purpose they make use of the ministry of the druids; because they have declared, that the anger of the immortal gods cannot be appeased, so as to spare the life of one man but by the life of another." This way of thinking gave rise also to that great number of magical rites and incantations with which the medical practices of the druids, and indeed of all the physicians of antiquity, were attended. "No body doubts (says Pliny) that magic derived its origin from medicine, and that by its flattering but delusive promises, it came to be esteemed the most sublime and sacred part of the art of healing."

II
Botany.

That the druids made great use of herbs for medicinal purposes, we have sufficient evidence. They not only had a most superstitious veneration for the mistletoe of the oak, on a religious account, but they also entertained a very high opinion of its medical virtues, and esteemed it a kind of panacea or remedy for all diseases. "They call it (says Pliny) by a name which in their language signifies *Albeal*, because they have an opinion that it cureth all diseases." They believed it to be in particular a specific against barrenness, and a sovereign antidote against the fatal effects of poisons of all kinds. It was esteemed also an excellent emollient and discutient for softening and discussing hard tumors; good for drying up serophulous sores; for curing ulcers and wounds; and (provided it was not suffered to touch the earth after it was cut) it was thought to be a very efficacious medicine in the epilepsy or falling-sickness. It hath been thought useful in this last calamitous disease by some modern physicians. The pompous ceremonies with which the mistletoe was gathered by the druids have been already described. The selago, a kind of hedge hyssop resembling favin, was another plant much admired by the druids of Gaul and Britain for its supposed medicinal virtues, particularly in all diseases of the eyes. But its efficacy, according to them, depended very much upon its being gathered exactly in the following manner: The person who gathered it was to be clothed in a white robe, to have his feet bare, and washed in pure water; to offer a sacrifice of bread and wine before he proceeded to cut it; which he was to do with his right hand covered with the skirt of his garment, and with a hook of some more precious metal than iron. When it was cut, it was to be received into, and kept in a new and very clean cloth. When it was gathered exactly according to this whimsical ritual, they affirmed that it was not only an excellent medicine, but also a

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powerful charm and preservative from misfortunes and unhappy accidents of all kinds. They entertained a high opinion also of the herb *Samolus* or marshwort, for its sanative qualities; and gave many directions for the gathering it, no less fanciful than those above mentioned. The person who was to perform that office was to do it fasting, and with his left hand; he was on no account to look behind him, nor to turn his face from the herbs he was gathering. It would be tedious to relate the extravagant notions they entertained of the many virtues of the vervain, and to recount the ridiculous mummeries which they practised in gathering and preparing it, both for the purposes of divination and physic. These things may be seen in Plin. Hist. Nat. l. 25. c. 9. from whence we have received all these anecdotes of the botany of the druids. It is easy to see that his information was very imperfect; and that, like many of the other Greek and Roman writers, he designedly represents the philosophers of Gaul and Britain in an unfavourable light. The herb which was called *Britannica* by the ancients, which some think was the great water-dock, and others the cochlearia or scurvy-grass, was probably much used in this island for medical purposes; as it derived its name from hence, and was from hence exported to Rome and other parts. Though these few imperfect hints are all that we can now collect of the botany of the British druids, yet we have some reason to think that they were not contemptible botanists. Their circumstances were peculiarly favourable for the acquisition of this kind of knowledge. For as they spent most of their time in the recesses of mountains, groves, and woods, the spontaneous vegetable productions of the earth constantly presented themselves to their view, and courted their attention.

The opinions which, it is said, the druids of Gaul and Britain entertained of their anguinum or serpents egg, both as a charm and as a medicine, are romantic and extravagant in a very high degree. This extraordinary egg was formed, as they pretended, by a great number of serpents interwoven and twined together; and when it was formed, it was raised up in the air by the hissing of these serpents, and was to be caught in a clean white cloth, before it fell to the ground. The person who caught it was obliged to mount a swift horse, and to ride away at full speed to escape from the serpents, who pursued him with great rage, until they were stopped by some river. The way of making trial of the genuineness of this egg was no less extraordinary. It was to be enchased in gold, and thrown into a river, and if it was genuine it would swim against the stream. "I have seen (says Pliny) that egg; it is about the bigness of a moderate apple, its shell is a cartilaginous incrustation, full of little cavities, such as are on the legs of the polypus; it is the insignia, or badge of distinction of the druids." The virtues which they ascribed to this egg were many and wonderful. It was particularly efficacious to render those who carried it about with them superior to their adversaries in all disputes, and to procure them the favour and friendship of great men. Some have thought that this whole affair of the serpents egg was a mere fraud, contrived by the druids, to excite the admiration and pick the pockets of credulous people, who purchased these wonder-working eggs from them.

at

Druids.

at a high price. Others have imagined that this story of the anguinum (of which there is an ancient monument in the cathedral at Paris) was an emblematical representation of the doctrine of the druids concerning the creation of the world. The serpents, say they, represent the Divine Wisdom forming the universe, and the egg is the emblem of the world formed by that Wisdom. It may be added, that the virtue ascribed to the anguinum, of giving those who possessed it a superiority over others, and endearing them to great men, may perhaps be intended to represent the natural effects of learning and philosophy. But in so doubtful a matter every one is at full liberty to form what judgment he thinks proper.

12
Rhetoric.

As the influence and authority of the druids in their country depended very much upon the reputation of their superior wisdom and learning, they wisely applied to the study of those sciences which most directly contributed to the support and advancement of that reputation. In this number, besides those already mentioned, we may justly reckon rhetoric, which was diligently studied and taught by the druids of Gaul and Britain; who to the charms of their eloquence were indebted for much of the admiration and authority which they enjoyed. They had indeed many calls and opportunities to display their eloquence, and to discover its great power and efficacy; as, when they were teaching their pupils in their schools, when they discoursed in public to the people on religious and moral subjects, when they pleaded causes in the courts of justice, and when they harangued in the great councils of the nation, and at the heads of armies ready to engage in battle; sometimes with a view to inflame their courage, and at other times with a design to allay their fury, and dispose them to make peace. Though this last was certainly a very difficult task among fierce and warlike nations, yet such was the authority and eloquence of the druids that they frequently succeeded in it. "They pay a great regard (says Diodorus Siculus) to their exhortations, not only in the affairs of peace, but even of war, and these are respected both by their friends and enemies. They sometimes step in between two hostile armies, who are standing with their swords drawn and their spears extended, ready to engage; and by their eloquence, as by an irresistible enchantment, they prevent the effusion of blood, and prevail upon them to sheath their swords. So great are the charms of eloquence and the power of wisdom, even among the most fierce barbarians." The British kings and chieftains, who were educated by the druids, were famous for their eloquence. This is evident from the many noble speeches which are ascribed to them by the Greek and Roman writers. For though these speeches may not be genuine, yet they are a proof that it was a well-known fact that these princes were accustomed to make harangues on these and the like occasions. This we are expressly told by Tacitus. "The British chieftains, before a battle, fly from rank to rank, and address their men with animating speeches, tending to inflame their courage, increase their hopes, and dispel their fears." These harangues were called, in the ancient language of Britain, *Brofnichy Kah*, which is literally translated by Tacitus *Incitamenta Belli*, "incentives to war." The genuine posterity of the ancient Britons

long retained their taste for eloquence, and their high esteem for those who excelled in that art. "Orators (says Mr Martin) were in high esteem, both in these islands (the *Æbude*) and the continent, until within these forty years. They sat always among the nobles or chiefs of families in the steeple or circle. Their houses and little villages were sanctuaries, as well as churches, and they took place before doctors of physic. The orators, after the druids were extinct, were brought in to preserve the genealogy of families, and to repeat the same at every succession of a chief; and upon the occasion of marriages and births, they made epithalamiums and panegyrics, which the poet or bard pronounced. The orators, by the force of their eloquence, had a powerful ascendant over the greatest men in their time. For if any orator did but ask the habit, arms, horse, or any other thing belonging to the greatest man in these islands, it was readily granted him; sometimes out of respect, and sometimes for fear of being exclaimed against by a satyr, which in those days was reckoned a great dishonour."

If the British druids, considering the times in which they lived, had made no contemptible proficiency in several parts of real and useful learning; it cannot be denied that they were also great pretenders to superior knowledge in certain vain fallacious sciences, by which they excited the admiration, and took advantage of the ignorance and credulity of mankind. These were the sciences (if they may be so called) of magic and divination; by which they pretended to work a kind of miracles, and exhibit astonishing appearances in nature; to penetrate into the counsels of heaven; to foretel future events, and to discover the success or miscarriage of public or private undertakings. Their own countrymen not only believed that the druids of Gaul and Britain were possessed of these powers, but they were celebrated on this account by the philosophers of Greece and Rome. "In Britain (says Pliny) the magic arts are cultivated with such astonishing success, and so many ceremonies at this day, that the Britons seem to be capable of instructing even the Persians themselves in these arts. They pretend to discover the designs and purposes of the gods. The Eubates or Vates in particular investigate and display the most sublime secrets of nature; and, by auspices and sacrifices, they foretel future events." They were so famous for the supposed veracity of their predictions, that they were not only consulted on all important occasions by their own princes and great men, but even sometimes by the Roman emperors. Nor is it very difficult to account for all this. The druids finding that the reputation of their magical and prophetic powers contributed not a little to the advancement of their wealth and influence, they endeavoured, no doubt, to strengthen and establish it by all their art and cunning. Their knowledge of natural philosophy and mechanics enabled them to execute such works, and to exhibit such appearances, or to make the world believe that they did exhibit them, as were sufficient to gain them the character of great magicians. The truth is, that nothing is more easy than to acquire this character in a dark age, and among an unenlightened people. When the minds of men are haunted with dreams of charms and enchantments, they are apt to fancy that the most common occurrences

13
Magic and
divination.

Druids.

currences in nature are the effects of magical arts. The following strange story, which we meet with in Plutarch's *Treatise of the Cessation of Oracles*, was probably occasioned by something of this kind. "There are many islands which lie scattered about the isle of Britain, after the manner of our Sporades. They are generally unpeopled, and some of them are called the *Islands of the Heroes*. One Demetrius was sent by the emperor (perhaps Claudius) to discover those parts. He arrived at one of these islands (supposed by some to be Anglesey, but more probably one of *Æbudæ*) next adjoining to the isle of Britain before mentioned, which was inhabited by a few Britons, who were esteemed sacred and inviolable by their countrymen. Immediately after his arrival the air grew black and troubled, and strange apparitions were seen; the winds rose to a tempest, and fiery spouts and whirlwinds appeared dancing towards the earth." This was probably no more than a storm of wind, accompanied with rain and lightning; a thing neither unnatural nor uncommon: but Demetrius and his companions having heard that the British druids, by whom this isle was chiefly inhabited, were great magicians, they imagined that it was raised by them; and fancied that they saw many strange unnatural sights. The druids did not think proper to undeceive them; for when they enquired at them about the cause of this storm, they told them it was occasioned by the death of one of those invisible beings or genii who frequented their isle. A wonderful and artful tale, very well calculated to encrease the superstitious terrors of Demetrius and his crew; and to determine them to abandon this enchanted isle, with a resolution never to return. Stonehenge, and several other works of the druids, were believed to have been executed by the arts of magic and enchantment, for many ages after the destruction of their whole order: nor is it improbable that they persuaded the vulgar in their own times to entertain the same opinion of these works, by concealing from them the real arts by which they were performed. The natural and acquired sagacity of the druids, their long experience, and great concern in the conduct of affairs, enabled them to form very probable conjectures about the events of enterprises. These conjectures they pronounced as oracles, when they were consulted; and they pretended to derive them from the inspection of the entrails of victims, the observation of the flight and feeding of certain birds, and many other mummeries. By these, and the like arts, they obtained and preserved the reputation of prophetic foresight among an ignorant and credulous people. But these pretensions of the druids to magic and divination, which contributed so much to the advancement of their fame and fortune in their own times, have brought very heavy reproaches upon their memory, and have made some learned moderns declare that they ought to be expunged out of the catalogue of philosophers, and esteemed no better than mere cheats and jugglers. This censure is evidently too severe, and might have been pronounced with equal justice upon all the ancient philosophers of Egypt, Assyria, Persia, Greece, and Rome; who were great pretenders to magic and divination, as well as our druids. "I know of no nation in the world (says Cicero) either so polite and learned, or so savage and

barbarous, as not to believe that future events are prefigured to us, and may by some men be discovered and foretold." The only conclusion therefore that can be fairly drawn, from the successful pretensions of the British druids to the arts of magic and divination, is this—That they had more knowledge than their countrymen and cotemporaries; but had not so much virtue to resist the temptation of imposing upon their ignorance, to their own advantage.

DRUM, is a martial musical instrument in form of a cylinder, hollow within, and covered at the two ends with vellum, which is stretched or slackened at pleasure by the means of small cords or sliding knots. It is beat upon with sticks. Drums are sometimes made of brass, but most commonly they are of wood.—The drum is by Le Clerc said to have been an oriental invention, and to have been brought by the Arabians, or perhaps rather the Moors, into Spain.

Kettle Drums, are two sorts of large basons of copper or brass, rounded in the bottom, and covered with vellum or goat skin, which is kept fast by a circle of iron round the body of the drum, with a number of screws to screw up and down. They are much used among the horse; as also in operas, oratorios, concerts, &c.

DRUM, or *Drummer*, he that beats the drum; of whom each company of foot has one, and sometimes two. Every regiment has a drum-major, who has the command over the other drums. They are distinguished from the soldiers by cloaths of a different fashion: their post, when a battalion is drawn up, is on the flanks, and on a march it is betwixt the divisions.

Drum of the Ear, the same with the *tympanum*. See ANATOMY, n° 141.

DRUMMOND (William), a polite writer, born in Scotland in 1585, was the son of Sir John Drummond, who for ten or twelve years was usher and afterwards knight of the black rod to James VI. His family became first distinguished by the marriage of Robert III. whose queen was sister to William Drummond of Carnock their ancestor; as appears by the patents of that king and James I. the one calling him "our brother," the other "our uncle."

Drummond was educated at Edinburgh, where he took the degree of A. M. In 1606 he was sent by his father to study civil law at Bourges in France: but having no taste for the profession of a lawyer, he returned to Scotland, and retired to his agreeable seat at Hawthornden; where he applied himself with great assiduity to classical learning and poetry, and obliged the world with several fine productions. Here he wrote his *Cypress Grove*, a piece of excellent prose, after a dangerous fit of sickness; and about the same time, his *Flowers of Sion*, in verse. But an accident befel him, which obliged him to quit his retirement; and that was the death of an amiable lady to whom he was just going to be married. This affected him so deeply, that he went to Paris and Rome, between which two places he resided eight years. He travelled also thro' Germany, France, and Italy: where he visited universities; conversed with learned men; and made a choice collection of the ancient Greek, and of the modern Spanish, French, and Italian books. He then returned to his native country; and some time thereafter married.

Drum,
Drum-
mond.

Drum-
mond.

married Margaret Logan, a grand-daughter of Sir Robert Logan. Upon the appearance of a civil war, he retired again; and in this retirement is supposed to have written his history of the Five James's, successively kings of Scotland, which was not published till after his death. Having been grafted as it were on the royal family of Scotland, and upheld by them, he was steadily attached to Charles I.; but does not appear ever to have armed for him. As he had always been a laborious student, and had applied himself equally to history and politics as to classical learning, his services were better rendered by occasional publications, in which he several times distinguished himself. In a piece called *Irene*, he harangues the king, nobility, and clergy, about their mutual mistakes, fears, and jealousies; and lays before them the consequences of a civil war, from indisputable arguments and the histories of past times. The great Marquis of Montrose wrote a letter to him, desiring him to print this *Irene*, as the best means to quiet the minds of a distracted people: he likewise sent him a protection dated August 1645, immediately after the battle of Kilsyth, with a letter, in which he commends Mr Drummond's learning and loyalty. Mr Drummond wrote other things also with the same view of promoting peace and union, of calming the disturbed minds of the people, of reasoning the better sort into moderation, and checking the growing evils which would be the consequence of their obstinacy. But his efforts were fruitless; and his attachment to the king and his cause were so strong, that when he heard of the sentence being executed on him, he was overwhelmed with grief, and lifted his head no more. He died in the year 1649, leaving behind him several children: the eldest of whom, William, was knighted by Charles II. He had a great intimacy and correspondence with the two famous English poets, Michael Drayton and Ben Johnson; the latter of whom, at the age of 45, travelled from London on foot, to visit him at Hawthornden. An edition of his works, with his life prefixed, was printed in folio at Edinburgh, 1711.

† Cursory
Remarks on
some of the
English
Poets, 8vo.
1789.

Among all the writers, at the beginning of the last century, who flourished after the death of Shakespeare, an ingenious critic† observes, there is not one whom a general reader of the English poetry of that age will regard with so much and so deserved attention as William Drummond. In a survey of his poetry, two considerations must be had, viz. the nation of which he was, and the time when he wrote. Yet will these be found not offered to extenuate faults, but to increase admiration. His thoughts are often, nay generally, bold and highly poetical: he follows nature, and his verses are delicately harmonious. As his poems are not easily met with, and have perhaps by many readers never been heard of, a few extracts may be excused.

On the death of Henry prince of Wales in 1612, Drummond wrote an elegy intitled *Tears on the Death of Moeliades*; a name which that prince had used in all his challenges of martial sport, as the anagram of *Miles a Deo*. In this poem are lines, according to Denham's terms, as strong, as deep, as gentle, and as full, as any of his or Waller's. The poet laments the fate of the prince, that he died not in some glorious cause of war: "against the Turk (he says) thou hadst ended thy life and the Christian war together;"

N^o 104.

Or, as brave Bourbon, thou hadst made old Rome,
Queen of the world, thy triumph and thy tombe.

Of the lamentation of the river Forth:

And as she rush'd her Cyclades among,
She seem'd to plain that Heaven had done her wrong.

Further:

Tagus did court his love with golden streams,
Rhine with her towns, fair Seine with all she claims:
But ah, poor lovers! death did them betray;
And, unsuspected, made their hopes his prey.

And concludes:

The virgins to thy tomb will garlands bear
Of flow'rs, and with each flow'r let fall a tear.
Moeliades sweet courtly nymphs deplore,
From Thule to Hydaspes' pearly shore.

Perhaps there are no lines of Pope of which the easy flow may be more justly admired than of those in his third pastoral:

Not bubbling fountains to the thirsty swain,
Not balmy sleep to lab'ers faint with pain,
Not show'rs to larks, or sun-shine to the bee,
Are half so charming as thy sight to me.

When King James I. after his accession to the English throne, returned to Scotland in 1617, his arrival was celebrated by every effort of poetical congratulation. Upon this occasion Drummond composed a panegyric intitled *The Wandering Muses*, or the River Forth feasting; in which are found four lines apparently imitated by Pope in the above passage, and which do not in point of harmony fall much short of that imitation. He says,

To virgins, flow'rs; to sun-burnt earth, the rain;
To mariners, fair wind amidst the main;
Cool shades, to pilgrims whom hot glances burn;
Are not so pleasing as thy blest return.

Of these two poems of Drummond, it is observable, that the first was written in 1612, the last in 1617. The earliest piece of Waller is that to the king on his navy in 1625. The piece in which Sir John Denham's greatest force lies, *Cooper's Hill*, was not written till 1640. The harmony of Drummond, therefore, at a time when those who are usually called the first introducers of a smooth and polished versification had not yet begun to write, is an honour to him that should never be forgotten. Nor is his excellence half enough praised or acknowledged.

Drummond and Petrarch had this in common, that each lamented, first the cruelty, and then the loss of his mistress; so that their sonnets are alike naturally divided into two parts, those before and those after their several mistresses' deaths. It may justly be doubted, that among all the sonneteers in the English language any one is to be preferred to Drummond. He has shown in some of these compositions nearly the spirit of Petrarch himself. Of each period one is here inserted; the first, before the death of his mistress:

Ah me, and am I now the man, whose muse
In happier times was wont to laugh at love,
In those who suffered that blind boy abuse
The noble gifts were giv'n them from above!

What metamorphose strange is this I prove?
Myself I scarce now find myself to be;
And think no fable Circe's tyrannie,
And all the tales are told of changed Jove.

Drum-
mond.

Virtue

Druids,
Drunkenn-
ness.

Virtue hath taught, with her philosophy,
My mind unto a better course to move;
Reason may chide her full, and oft reprove
Affection's pow'r; but what is that to me,
Who ever think, and never think on aught
But that bright cherubim which thralls my thought!

From Part II. after her death, (Sonnet I.)

Of mortal glory, O soon dark'ned ray!
O winged joys of man, more swift than wind!
O fond desires which in our fancies stray!
O traiterous hopes which do our judgments blind!

Lo, in a flash that light is gone away,
Which dazzle did each eye, delight each mind;
And with that sun from whence it came combin'd,
Now makes more radiant heav'n's eternal day.

Let Beauty now bedew her cheeks with tears;
Let widow'd Music only roar and groan;
Poor Virtue, get thee wings and mount the spheres,
For dwelling-place on earth for thee is none:
Death hath thy temple raz'd, Love's empire soil'd,
The world of honour, worth, and sweetness spoil'd.

The seventh sonnet of the first part has much resemblance to Sir Henry Wotton's elegant little poem on the Queen of Bohemia, "Ye meaner beauties," &c. Among Drummond's Flowers of Sion, the poem which begins "Amidst the azure clear—of Jordan's sacred streams," eminently distinguishes him, whether he be considered as a philosopher or a poet.

DRUNKENNESS, a well known disorder in the brain, occasioned by drinking too freely of spirituous liquors. Drunkenness appears in different shapes in different constitutions: some it makes gay, some sul-
len, and some furious. The mischief of drunkenness consists in the following bad effects: 1. It betrays most constitutions either into extravagancies of anger, or sins of lewdness. 2. It disqualifies men for the duties of their station, both by the temporary disorder of their faculties, and at length by a constant incapacity and stupefaction. 3. It is attended with expences, which can often be ill spared. 4. It is sure to occasion uneasiness to the family of the drunkard. 5. It shortens life. To these consequences of drunkenness must be added the peculiar danger and mischief of the example. "Drunkenness (Mr Paley observes) is a social festive vice. The drinker collects his circle; the circle naturally spreads; of those who are drawn within it, many become the corrupters and centres of sets and circles of their own; every one countenancing, and perhaps emulating the rest, till a whole neighbourhood be infected from the contagion of a single example. With this observation upon the spreading quality of drunkenness, may be connected a remark which belongs to the several evil effects above recited. The consequences of a vice, like the symptoms of a disease, though they be all enumerated in the description, seldom all meet in the same subject. In the instance under consideration, the age and temperature of one drunkard may have little to fear from inflammations of lust or anger; the fortune of a second may not be injured by the expence; a third may have no family to be disquieted by his irregularities; and a fourth may possess a constitution fortified against the poison of strong liquors. But if, as we always ought to do, we comprehend within the consequences of our conduct the mischief and tendency of the example, the above circumstances, however fortunate for the individual, will be found to vary the guilt of his intemperance less, probably, than he sup-

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poses. Although the waste of time and money may be of small importance to you, it may be of the utmost to some one or other whom your society corrupts. Repeated, or long continued excesses, which hurt not your health, may be fatal to your companion. Although you have neither wife nor child, nor parent, to lament your absence from home, or expect your return to it with terror; other families, whose husbands and fathers have been invited to share in your ebriety, or encouraged to imitate it, may justly lay their misery or ruin at your door. This will hold good, whether the person seduced be seduced immediately by you, or the vice be propagated from you to him, through several intermediate examples."

The ancient Lacedemonians used to make their slaves frequently drunk, to give their children an aversion and horror for the same. The Indians hold drunkenness a species of madness; and in their language, the same term (*ramgam*), that signifies "drunkard," signifies also a "phrenetick."

Drunkenness is repeatedly forbidden by St Paul: "Be not drunk with wine, wherein is excess." "Let us walk honestly as in the day, not in rioting and drunkenness." "Be not deceived: neither fornicators, nor drunkards, nor revilers, nor extortioners, shall inherit the kingdom of God." Eph. v. 18. Rom. xiii. 13. 1. Cor. vi. 9, 10. The same apostle likewise condemns drunkenness, as peculiarly inconsistent with the Christian profession: "They that be drunken, are drunken in the night; but let us, who are of the day, be sober." 1. Thess. v. 7, 8.

Drunkenness, by our laws, is looked upon as an aggravation rather than an excuse for any criminal behaviour. A drunkard, says Sir Edward Coke, who is *voluntarius demon*, hath no privilege thereby; but what hurt or ill soever he doth, his drunkenness doth aggravate it: *nam omne crimen ebrietas, et incendit, et detegit*. It hath been observed that the real use of strong liquors, and the abuse of them by drinking to excess, depend much upon the temperature of the climate in which we live. The same indulgence which may be necessary to make the blood move in Norway, would make an Italian mad. A German therefore, says the president Montesquieu, drinks through custom founded upon constitutional necessity; a Spaniard drinks through choice, or out of the mere wantonness of luxury; and drunkenness, he adds, ought to be more severely punished where it makes men mischievous and mad, as in Spain and Italy, than where it only renders them stupid and heavy, as in Germany and more northern countries. And accordingly, in the warmer climate of Greece, a law of Pittacus enacted, "that he who committed a crime when drunk, should receive a double punishment;" one for the crime itself, and the other for the ebriety which prompted him to commit it. The Roman law indeed made great allowances for this vice: *per vinum delapsis capitalis poena remittitur*. But the law of England, considering how easy it is to counterfeit this excuse, and how weak an excuse it is (though real), will not suffer any man thus to privilege one crime by another.

For the offence of drunkenness a man may be punished in the ecclesiastical court, as well as by justices of peace by statute. And by 4 Jac. I. c. 5. and 21 Jac. I. c. 7. if any person shall be convicted of drunkenness

Drunkenn-
ness.

Drunkenness.

drunkenness by the view of a justice, oath of one witness, &c. he shall forfeit 5s. for the first offence, to be levied by distress and sale of his goods; and for want of a distress, shall sit in the stocks six hours: and, for the second offence, he is to be bound with two sureties in 10l. each, to be of good behaviour, or to be committed. And he who is guilty of any crime thro' his own voluntary drunkenness, shall be punished for it as if he had been sober. It has been held that drunkenness is a sufficient cause to remove a magistrate: and the prosecution for this offence by the statute of 4 Jac. I. c. 5. was to be, and still may be, before justices of peace in their sessions by way of indictment, &c. Equity will not relieve against a bond, &c. given by a man when drunk, unless the drunkenness is occasioned through the management or contrivance of him to whom the bond is given.

The appetite for intoxicating liquors appears to be almost always acquired. One proof of which is, that it is apt to return only at particular times and places; as after dinner, in the evening, on the market day, at the market town, in such a company, at such a tavern. And this may be the reason, that if a habit of drunkenness be ever overcome, it is upon some change of place, situation, company, or profession. A man sunk deep in a habit of drunkenness, will upon such occasions as these, when he finds himself loosened from the associations which held him fast, sometimes make a plunge, and get out. In a matter of such great importance, it is well worth while, where it is tolerably convenient, to change our habitation and society, for the sake of the experiment.

Habits of drunkenness commonly take their rise either from a fondness for and connection with some company, or some companion, already addicted to this practice; which affords an almost irresistible invitation to take a share in the indulgencies which those about us are enjoying with so much apparent relish and delight; or from want of regular employment, which is sure to let in many superfluous cravings and customs, and often this amongst the rest; or, lastly, from grief or fatigue, both which strongly solicit that relief which inebriating liquors administer for the present, and furnish a specious excuse for complying with the inclination. But the habit, when once set in, is continued by different motives from those to which it owes its origin. Persons addicted to excessive drinking suffer, in the intervals of sobriety, and near the return of their accustomed indulgence, a faintness and oppression about the *praecordia* which it exceeds the ordinary patience of human nature to endure. This is usually relieved for a short time by a repetition of the same excess: and to this relief, as to the removal of every long continued pain, they who have once experienced it are urged almost beyond the power of resistance. This is not all: as the liquor loses its stimulus, the dose must be increased, to reach the same pitch of elevation or ease; which increase proportionably accelerates the progress of all the maladies that drunkenness brings on. Whoever reflects, therefore, upon the violence of the craving in advanced stages of the habit, and the fatal termination to which the gratification of it leads, will, the moment he perceives the least tendency in himself of a growing inclination to intemperance, collect his resolution to this point; or (what perhaps he

will find his best security) arm himself with some peremptory rule, as to the times and quantity of his indulgencies.

DRUPA, or DRUPPA, in botany, a species of *pericarpium* or seed-vessel, which is succulent or pulpy, has no valve or external opening like the capsule and pod, and contains within its substance a stone or nut. The cherry, plum, peach, apricot, and all other stone-fruit are of this kind.

The term, which is of great antiquity, is synonymous to Tournefort's *fructus mollis officulo*, "soft fruit with a stone;" and to the *prunus* of other botanists.

The stone or nut, which in this species of fruit is surrounded by the soft pulpy flesh, is a kind of ligneous or woody cup, which contains a single kernel or seed.

This definition, however, will not apply to every seed-vessel denominated *drupa* in the *Genera Plantarum*. The almond is a *drupa*, so is the seed-vessel of the elm-tree and the genus *rumphia*, though far from being pulpy or succulent; the first and third are of a substance like leather, the second like parchment. The same may be said of the walnut, pistachia-nut, *guettarda*, *quifqualis*, jack-in-a-box, and some others.

Again, the seeds of the elm, *schrebera*, *flagellaria*, and the mango-tree, are not contained in a stone. The seed-vessel of burr-reed is dry, shaped like a top, and contains two angular stones.

This species of fruit, or more properly seed-vessel, is commonly roundish, and when seated below the calyx or receptacle of the flower, is furnished, like the apple, at the end opposite to the foot-stalk, with a small umbilicus or cavity, which is produced by the swelling of the fruit before the falling off of the flower-cup.

DRUSES, or DRUZES, a remarkable nation in Palestine, inhabiting the environs of Mount Lebanon, of whose origin and history we have the following detail by M. Volney.

Twenty-three years after the death of Mahomet, the disputes between Ali his son-in-law and Moaouia governor of Syria, occasioned the first schism in the empire of the Arabs, and the two sects subsist to this day: but, in reality, this difference related only to power; and the Mahometans, however divided in opinion respecting the rightful successor of the prophet, were agreed with respect to their dogmas. It was not until the following century that the perusal of Greek books introduced among the Arabs a spirit of discussion and controversy, to which till then they were utter strangers. The consequence was, as might be expected, by reasoning on matters not susceptible of demonstration, and guided by the abstract principles of an unintelligible logic, they divided into a multitude of sects and opinions. At this period, too, the civil power lost its authority; and religion, which from that derives the means of preserving its unity, shared the same fate, and the Mahometans now experienced what had before befallen the Christians. The nations which had received the religion of Mahomet, mixed with it their former absurd notions; and the errors which had anciently prevailed over Asia again made their appearance, though altered in their forms. The metempsychosis, the doctrine of a good and evil principle, and the renovation after six thousand years, as it had been taught by Zoroaster, were again revived among the Mahometans.

Drupa, Druses.

Druzes. Mahometans. In this political and religious confusion, every enthusiast became an apostle, and every apostle the head of a sect. No less than sixty of these were reckoned, remarkable for the numbers of their followers, all differing in some points of faith, and all disavowing heresy and error. Such was the state of these countries when at the commencement of the 11th century Egypt became the theatre of one of the most extravagant scenes of enthusiasm and absurdity ever recorded in history. The following account is extracted from the eastern writers.

In the year of the Hejira 386 (A. D. 996), the third caliph of the race of the Fatmites, called *Hakem-b' amr-ellah*, succeeded to the throne of Egypt at the age of 11 years. He was one of the most extraordinary princes of whom history has preserved the memory. He caused the first caliphs, the companions of Mahomet, to be cursed in the mosques, and afterwards revoked the anathema: He compelled the Jews and Christians to abjure their religion, and then permitted them to resume it. He prohibited the making slippers for women, to prevent them from coming out of their houses. He burnt one half of the city of Cairo for his diversion, while his soldiers pillaged the other. Not contented with these extravagant actions, he forbade the pilgrimage to Mecca, fasting, and the five prayers; and at length carried his madness so far as to desire to pass for God himself. He ordered a register of those who acknowledged him to be so, and the number amounted to sixteen thousand. This impious pretension was supported by a false prophet, who came from Persia into Egypt; which impostor, named *Mohammad-ben-Ismael*, taught that it was not necessary to fast or pray, to practise circumcision, to make the pilgrimage to Mecca, or observe festivals; that the prohibition of pork and wine was absurd; and that marriage between brothers and sisters, fathers and children, was lawful. To ingratiate himself with Hakem, he maintained that this caliph was God himself incarnate; and instead of his name *Hakem-b' amr-ellah*, which signifies *governing by the order of God*, he called him *Hakem-b' amr-eh*, *governing by his own order*. Unluckily for the prophet, his new god had not the power to protect him from the fury of his enemies, who slew him in a tumult almost in the arms of the caliph, who was himself massacred soon after on mount Mokattam, where he, as he said, had held conversation with angels.

The death of these two chiefs did not stop the progress of their opinions: a disciple of Mohammad-ben-Ismael, named *Hamza-ben-Ahmud*, propagated them with an indefatigable zeal in Egypt, in Palestine, and along the coast of Syria, as far as Sidon and Bergtus. His proselytes being persecuted by the sect in power, they took refuge in the mountains of Lebanon, where they were better able to defend themselves; at least it is certain, that, shortly after this era, we find them established there, and forming an independent society.

The difference of their opinions disposes them to be enemies; but the urgent interest of their common safety forces them to allow mutual toleration, and they have always appeared united, and have jointly opposed, at different times, the Crusaders, the sultans of Aleppo, the Mamlouks, and the Ottomans. The conquest of Syria by the latter, made no change in their situation. Selim I. on his return from Egypt, meditating

no less than the conquest of Europe, disdained to waste his time before the rocks of Lebanon. Soliman II. his successor, incessantly engaged in important wars, either with the knights of Rhodes, the Persians, the kingdom of Yemen, the Hungarians, the Germans, or the emperor Charles V. had no time to think of the Druzes. Emboldened by this inattention, and not content with their independence, they frequently descended from their mountains to pillage the Turks. The pachas in vain attempted to repel their inroads; their troops were invariably routed or repulsed. And it was not till the year 1588 that Amurath III. wearied with the complaints made to him, resolved, at all events, to reduce these rebels, and had the good fortune to succeed. His general Ibrahim Pacha marched from Cairo, and attacked the Druzes and Maronites with so much address and vigour as to force them into their strong holds, the mountains. Dissension took place among their chiefs, of which he availed himself to exact a contribution of upwards of one million of piasters, and to impose a tribute which has continued to the present time.

It appears that this expedition was the epocha of a considerable change in the constitution of the Druzes. Till then they had lived in a sort of anarchy, under the command of different shaiks or lords. The nation was likewise divided into two factions, such as is to be found in all the Arab tribes, and which are distinguished into the party Kaifi and the party Yamani. To simplify the administration, Ibrahim permitted them only one chief who should be responsible for the tribute, and execute the office of civil magistrate; and this governor, from the nature of his situation, acquiring great authority, became almost the king of the republic; but as he was always chosen from among the Druzes, a consequence followed which the Turks had not foreseen, and which was nearly fatal to their power. For the chief thus chosen, having at his disposal the whole strength of the nation, was able to give it unanimity and energy, and it naturally turned against the Turks; since the Druzes, by becoming their subjects, had not ceased to be their enemies. They took care, however, that their attacks should be indirect, so as to save appearances, and only engaged in secret hostilities, more dangerous, perhaps, than open war.

About this time, that is, the beginning of the 17th century, the power of the Druzes attained its greatest height; which it owed to the talents and ambition of the celebrated Faker-el-din, commonly called *Fakardin*. No sooner was this prince advanced to be the chief of that people than he turned his whole attention to humble the Ottoman power, and aggrandize himself at its expence. In this enterprize he displayed an address seldom seen among the Turks. He first gained the confidence of the Porte, by every demonstration of loyalty and fidelity; and as the Arabs at that time infested the plain of Balbek and the countries of Sour and Acre, he made war upon them, freed the inhabitants from their depredations, and thus rendered them desirous of living under his government.

The city of Bairout was situated advantageously for his designs, as it opened a communication with foreign countries, and, among others, with the Venetians, the natural enemies of the Turks. Faker-el-din

Druses. availed himself of the misconduct of the Aga, expelled him, seized on the city, and even had the art to make a merit of this act of hostility with the Divan, by paying a more considerable tribute. He proceeded in the same manner at Saide Balbek and Sour; and at length, about the year 1613, saw himself master of all the country as far as Adjaloun and Safad. The pachas of Tripoli and Damascus could not see these encroachments with indifference; sometimes they opposed him with open force, though ineffectually, and sometimes endeavoured to ruin him at the Porte by secret insinuations; but the Emir, who maintained there his spies and defenders, defeated every attempt.

At length, however, the Divan began to be alarmed at the progress of the Druzes, and made preparations for an expedition capable of crushing them. Whether from policy or fear, Faker-el-din did not think proper to wait this storm. He had formed connections in Italy, on which he built great hopes, and determined to go in person to solicit the succours they had promised him; persuaded that his presence would increase the zeal of his friends, while his absence might appease the resentment of his enemies. He therefore embarked at Bairout; and after resigning the administration to his son Ali, repaired to the court of the Medici at Florence. The arrival of an Oriental prince in Italy did not fail to attract the public attention. Enquiry was made into his nation, and the origin of the Druzes became popular topics of research. Their history and religion were found to be so little known as to leave it a matter of doubt whether they should be classed with the Mahometans or Christians. The Crusades were called to mind; and it was soon suggested, that a people who had taken refuge in the mountains, and were enemies to the natives, could be no other than the offspring of the Crusaders.

This idle conceit was too favourable to Faker-el-din for him to endeavour to disprove it: he was artful enough, on the contrary, to pretend he was related to the house of Lorraine; and the missionaries and merchants, who promised themselves a new opening for conversion and commerce, encouraged his pretensions. When an opinion is in vogue, every one discovers new proofs of its certainty. The learned in etymology, struck with the resemblance of the names, insisted, that Druzes and Dreux must be the same word; and on this foundation formed the system of a pretended colony of French Crusaders, who, under the conduct of a Comte de Dreux, had formed a settlement in Lebanon. This hypothesis, however, was completely overthrown by the remark, that the name of the Druzes is to be found in the itinerary of Benjamin of Tudela, who travelled before the time of the Crusades. Indeed the futility of it ought to have been sufficiently apparent at first, from the single consideration, that had they been descended from any nation of the Franks, they must have retained at least the traces of some European language; for a people, retired into a separate district, and living distinct from the natives of the country, do not lose their language. That of the Druzes, however, is very pure Arabic, without a single word of European origin. The real derivation of the name of this people has been long in our possession without our knowing it. It

Druses. originates from the founder of the sect of Mohammad-ben-Ismael, who was surnamed *El-Dorzi*, and not *El-Darari*, as it is usually printed: the confusion of these two words, so different in our writing, arises from the figure of the two Arabic letters *r* and *z*, which have only this difference, that the *z* has a point over it, frequently omitted or effaced in the manuscripts.

After a stay of nine years in Italy, Faker-el-din returned to resume the government of his country. During his absence, his son Ali had repulsed the Turks, appeased discontents, and maintained affairs in tolerable good order. Nothing remained for the Emir, but to employ the knowledge he could not but have acquired, in perfecting the internal administration of government, and promoting the welfare of the nation; but instead of the useful and valuable arts, he wholly abandoned himself to the frivolous and expensive, for which he had imbibed a passion while in Italy. He built numerous villas; constructed baths, and planted gardens; he even presumed, without respect to the prejudices of his country, to employ the ornaments of painting and sculpture, notwithstanding these are prohibited by the Koran.

The consequences of this conduct soon manifested themselves: the Druzes, who paid the same tribute as in time of war, became dissatisfied. The Yamani faction were roused; the people murmured at the expences of the prince; and the luxury he displayed renewed the jealousy of the pachas. They attempted to levy greater tribute: hostilities again commenced, and Faker-el-din repulsed the forces of the pachas; who took occasion, from this resistance, to render him suspected by the sultan himself. Amurath III. incensed that one of his subjects should dare to enter into a competition with him, resolved on his destruction; and the pacha of Damascus received orders to march, with all his forces, against Bairout, the usual residence of Faker-el-din; while 40 galleys invested it by sea, and cut off all communication.

The Emir, who depended on his good fortune and succours from Italy, determined at first to brave the storm. His son Ali, who commanded at Safad, was ordered to oppose the progress of the Turkish army; and in fact he bravely resisted them, notwithstanding the great disparity of his forces: but after two engagements, in which he had the advantage, being slain in a third attack, the face of affairs were greatly changed, and every thing went to ruin. Faker-el-din, terrified at the loss of his troops, afflicted at the death of his son, and enfeebled by age and a voluptuous life, lost both courage and presence of mind. He no longer saw any resource but in a peace, which he sent his second son to solicit of the Turkish admiral, whom he attempted to seduce by presents; but the admiral, detaining both the presents and envoy, declared he would have the prince himself. Faker-el-din, intimidated, took to flight, and was pursued by the Turks, now masters of the country. He took refuge on the steep eminence of Niha, where they besieged him ineffectually for a whole year, when they left him at liberty: but shortly after, the companions of his adversity, wearied with their sufferings, betrayed and delivered

Druzes. delivered him up to the Turks. Faker-el-din, though in the hands of his enemies, conceived hopes of pardon, and suffered himself to be carried to Constantinople; where Amurath, pleased to behold at his feet a prince so celebrated, at first treated him with that benevolence which arises from the pride of superiority; but soon returning to his former jealousies, yielded to the instigations of his courtiers, and, in one of his violent fits of passion, ordered him to be strangled, about the year 1631.

After the death of Faker-el-din, the posterity of that prince still continued in possession of the government, though at the pleasure, and as vassals, of the Turks. This family failing in the male line at the beginning of the present century, the authority devolved, by the election of the shaiks, on the house of Shelah, in which it still continues. The only emir of that house, whose name deserves to be preserved, is the emir Melhem, who reigned from 1740 to 1759; in which interval he retrieved the losses of the Druzes, and restored them to that consequence which they had lost by the defeat of Faker-el-din. Towards the end of his life, about the year 1754, Melhem, wearied with the cares of government, abdicated his authority, to live in religious retirement, after the manner of the Okkals; but the troubles that succeeded occasioned him once more to resume the reins of government, which he held till 1759, when he died, universally regretted.

He left three sons, minors: the eldest of whom ought, according to the custom of the country, to have succeeded him; but being only 11 years of age, the authority devolved on his uncle Mansour, agreeable to a law very general in Asia, which wills the people to be governed by a sovereign who has arrived at years of maturity. The young prince was but little fitted to maintain his pretensions; but a Maronite, named Sad-el-Kouri, to whom Melhem had entrusted his education, took this upon himself. Aspiring to see his pupil a powerful prince, that he might himself become a powerful visir, he made every exertion to advance his fortune. He first retired with him to Djebail, in the Kefraouan, where the emir Yousef possessed large domains, and there undertook to conciliate the Maronites, by embracing every opportunity to serve both individuals and the nation. The great revenues of his pupil, and the moderation of his expenditure, amply furnished him with the means. The farm of the Kefraouan was divided between several shaiks, with whom the Porte was not very well satisfied. Sad treated for the whole with the pacha of Tripoli, and got himself appointed sole receiver. The Motoualis of the valley of Balbek had for some years before made several encroachments on Lebanon, and the Maronites began to be alarmed at the near approach of these intolerant Mahometans. Sad purchased of the pacha of Damascus a permission to make war upon them; and in 1763 drove them out of the country. The Druzes were at that time divided into two factions: Sad united his interest with those who opposed Mansour, and secretly prepared the plot which was to raise the nephew on the ruin of the uncle.

At this period the Arab Daher, who had made himself master of Galilee, and fixed his residence at

Acre, disquieted the Porte by his progress and pretensions: to oppose him, the Divan had just united the pachalics of Damascus, Saide, and Tripoli, in the hands of Osman and his children; and it was evident, that an open war was not very remote. Mansour, who dreaded the Turks too much to resist them, made use of the policy usual on such occasions, pretending a zeal for their service, while he secretly favoured their enemy. This was a sufficient motive for Sad to pursue measures directly opposite. He supported the Turks against the faction of Mansour, and manœuvred with so much good fortune or address as to depose that emir in 1770, and place Yousef in his government.

In the following year Ali Bey declared war and attacked Damascus. Yousef, called on by the Turks, took part in the quarrel, but without being able to draw the Druzes from their mountains to enter into the army of the Ottomans. Besides their natural repugnance, at all times, to make war out of their country, they were on this occasion too much divided at home to quit their habitations, and they had reason to congratulate themselves on the event. The battle of Damascus ensued; and the Turks, as we have already seen, were completely routed. The pacha of Saide escaping from this defeat, and not thinking himself in safety in that town, sought an asylum even in the house of the emir Yousef. The moment was unfavourable; but the face of affairs soon changed by the flight of Mohammad Bey. The emir, concluding that Ali Bey was dead, and not imagining that Daher was powerful enough singly to maintain the quarrel, declared openly against him. Saide was threatened with a siege, and he detached 1500 men of his faction to its defence; while himself in person, prevailing on the Druzes and Maronites to follow him, made an incursion with 25,000 peasants into the valley of Bekaa; and in the absence of the Motoualis, who had joined the army of Daher, laid the whole country waste with fire and sword from Balbek to Tyre.

While the Druzes, proud of this exploit, were marching in disorder towards the latter city, 500 Motoualis, informed of what had happened, flew from Acre inflamed with rage and despair, and fell with such impetuosity on their army as to give them a complete overthrow. Such was the surprise and confusion of the Druzes, that, imagining themselves attacked by Daher himself and betrayed by their companions, they turned their swords on each other as they fled. The steep declivities of Djezin, and the pine-woods which were in the route of the fugitives, were strewed with dead, but few of whom perished by the hands of the Motoualis.

The emir Yousef, ashamed of this defeat, escaped to Dair-el-Kamar, and shortly after attempted to take revenge; but being again defeated in the plain between Saide and Sour (Tyre), he was constrained to resign to his uncle Mansour the ring, which among the Druzes is the symbol of command. In 1773 he was restored by a new revolution; but he could not support his power but at the expence of a civil war. In order, therefore, to prevent Bairout falling into the hands of the adverse faction, he requested the assistance of the Turks, and demanded of the pacha of Damascus a man of sufficient abilities to defend that city. The choice

Druzes.

Druzes. choice fell on an adventurer ; who, from his subsequent fortune, merits to be made known.

This man, named Ahmad, is a native of Bosnia, and speaks the Slavonian as his mother tongue, as the Ragusan captains, with whom he converses in preference to those of every other nation, assert. It is said, that flying from his country at the age of 16, to escape the consequences of an attempt to violate his sister-in-law, he repaired to Constantinople, where, destitute of the means of procuring a subsistence, he sold himself to the slave-merchants to be conveyed to Egypt ; and, on his arrival at Cairo, was purchased by Ali Bey, who placed him among his Mamlouks.

Ahmad was not long in distinguishing himself by his courage and address. His patron employed him on several occasions in dangerous *coups de main*, such as the assassination of such beys and caches as he suspected ; of which commissions he acquitted himself so well as to acquire the name of *Djezzar*, which signifies *Cut-throat*. With this claim to his friendship, he enjoyed the favour of Ali until it was disturbed by an accident.

This jealous Bey having proscribed one of his benefactors called Saleh Bey, commanded Djezzar to cut off his head. Either from humanity or some secret friendship for the devoted victim, Djezzar hesitated, and even remonstrated against the order. But learning the next day that Mohammed Bey had executed the commission, and that Ali had spoken of him not very favourably, he thought himself a lost man, and, to avoid the fate of Saleh Bey, escaped unobserved, and reached Constantinople. He there solicited employments suitable to his former rank ; but meeting, as is usual in capitals, with a great number of rivals, he pursued another plan, and went to seek his fortune in Syria as a private soldier. Chance conducted him among the Druzes, where he was hospitably entertained, even in the house of the kiaya of the emir Yousef. From thence he repaired to Damascus, where he soon obtained the title of *Aga*, with a command of five pair of colours, that is to say, of 50 men ; and he was thus situated when fortune destined him to the government of Bairout.

Djezzar was no sooner established there than he took possession of it for the Turks. Yousef was confounded at this proceeding. He demanded justice at Damascus ; but finding his complaints treated with contempt, entered into a treaty with Daher, and concluded an offensive and defensive alliance with him at Ras-el-aen, near to Sour. No sooner was Daher united with the Druzes than he laid siege to Bairout by land, whilst two Russian frigates, whose service was purchased by 600 purses, cannonaded it by sea. Djezzar was compelled to submit to force, and, after a vigorous resistance, gave up the city and surrendered himself prisoner. Shaik Daher, charmed with his courage, and flattered with the preference he had given him in the surrender, conducted him to Acre, and showed him every mark of kindness. He even ventured to trust him with a small expedition into Palestine ; but Djezzar, on approaching Jerusalem, went over to the Turks and returned to Damascus.

The war of Mohammed Bey breaking out, Djezzar offered his service to the captain Pacha, and gained his confidence. He accompanied him to the siege of Acre ;

and that admiral having destroyed Daher, and finding no person more proper than Djezzar to accomplish the designs of the Porte in that country, named him pacha of Saide.

Being now, in consequence of this revolution, superior lord to the emir Yousef, Djezzar is mindful of injuries in proportion as he has reason to accuse himself of ingratitude. By a conduct truly Turkish, feigning alternately gratitude and resentment, he is alternately on terms of dispute and reconciliation with him, continually exacting money as the price of peace, or as indemnity for war. His artifices have succeeded so well, that within the space of five years he has extorted from the emir four millions of French money (above L. 160,000), a sum the more astonishing, as the farm of the country of the Druzes did not then amount to 100,000 livres (L. 4000).

In 1784 he made war on him, deposed him, and bestowed the government on the emir of the country of Hasbeya, named Ismael. Yousef, having once more purchased his favour, returned towards the end of the same year to Dair-el-Kamar, and even courted his confidence so far as to wait on him at Acre, from whence nobody expected him to return ; but Djezzar is too cunning to shed blood while there are any hopes of getting money : he released the prince, and sent him back with every mark of friendship. Since that period the Porte has named him pacha of Damascus, while he also retained the sovereignty of the pachalic of Acre, and of the country of the Druzes.

As to the religion of the Druzes : What has been already said of the opinions of Mohammed-ben-Ismael may be regarded as the substance of it. They practise neither circumcision, nor prayers, nor fasting ; they observe neither festivals nor prohibitions. They drink wine, eat pork, and allow marriage between brothers and sisters, though not between fathers and children. From this we may conclude, with reason, that the Druzes have no religion ; yet one class of them must be excepted, whose religious customs are very peculiar. Those who compose it are to the rest of the nation what the initiated were to the profane ; they assume the name of *Okkals*, which means spiritualists, and bestow on the vulgar the epithet of *Djabel* or ignorant ; they have various degrees of initiation, the highest orders of which require celibacy. These are distinguishable by the white turban they affect to wear, as a symbol of their purity ; and so proud are they of this supposed purity, that they think themselves sullied by even touching a profane person. If you eat out of their plate, or drink out of their cup, they break them ; and hence the custom, so general in this country, of using vases with a sort of cock, which may be drank out of without touching them with the lips. All their practices are enveloped in mysteries : their oratories always stand alone, and are constantly situated on eminences : in these they hold their secret assemblies, to which women are admitted. It is pretended they perform ceremonies there in presence of a small statue resembling an ox or a calf ; whence some have pretended to prove that they are descended from the Samaritans. But besides that the fact is not well ascertained, the worship of the ox may be deduced from other sources.

They have one or two books which they conceal with

Druzes.

Druzes. with the greatest care: but chance has deceived their jealousy; for in a civil war which happened 9 or 10 years ago, the emir Yousef, who is *Djabel* or ignorant, found one among the pillage of one of their oratories. M. Volney was assured, by persons who had read it, that it contains only a mystic jargon, the obscurity of which doubtless renders it valuable to adepts. Hakem Bamr-ellah is there spoken of, by whom they mean God incarnated in the person of the caliph. It likewise treats of another life, of a place of punishment, and a place of happiness where the Okkals shall of course be most distinguished. Several degrees of perfection are mentioned, to which they arrive by successive trials. In other respects, these sectaries have all the insolence and all the fears of superstition: they are not communicative, because they are weak; but it is probable that, were they powerful, they would be promulgators and intolerant.

The rest of the Druzes, strangers to this spirit, are wholly indifferent about religious matters. The Christians who live in their country pretend that several of them believe in the metempsychosis; that others worship the sun, moon, and stars: all which is possible; for, as among the Ansaria, every one, left to his own fancy, follows the opinion that pleases him most; and these opinions are those which present themselves most naturally to unenlightened minds. When among the Turks, they affect the exterior of Mahometans, frequent the mosques, and perform their ablutions and prayers. Among the Maronites, they accompany them to church, and, like them, make use of holy water. Many of them, importuned by the missionaries, suffer themselves to be baptized; and if solicited by the Turks, receive circumcision, and conclude by dying neither Christians nor Mahometans; but they are not so indifferent in matters of civil policy.

The Druzes may be divided into two classes: the common people; and the people of eminence and property, distinguished by the title of shaiks and emirs, or descendants of princes. The greater part are cultivators, either as farmers or proprietors; every man lives on his inheritance, improving his mulberry-trees and vineyards: in some districts they grow tobacco, cotton, and some grain, but the quantity of these is inconsiderable. It appears that at first all the lands were, as formerly in Europe, in the hands of a small number of families. But to render them productive, the great proprietors were forced to sell part of them, and let leases; which subdivision is become the chief source of the power of the state, by multiplying the number of persons interested in the public weal: there still exists, however, some traces of the original inequality, which even at this day produces pernicious effects. The great property possessed by some families gives them too much influence in all the measures of the nation; and their private interests have too great weight in every public transaction. Their history, for some years back, affords sufficient proofs of this; since all the civil or foreign wars in which they have been engaged have originated in the ambition and personal views of some of the principal families, such as the Lesbeks, the Djam-belats, the Ismaels of Solyma, &c. The shaiks of these houses, who alone possess one-tenth part of the country, procured creatures by their money, and at last involved all the Druzes in their dissensions. It

must be owned, however, that possibly to this conflict between contending parties the whole nation owes the good fortune of never having been enslaved by its chief.

This chief, called *Hakem* or governor, also *Emir* or prince, is a sort of king or general, who unites in his own person the civil and military powers. His dignity is sometimes transmitted from father to son, sometimes from one brother to another; and the succession is determined rather by force than any certain laws. Females can in no case pretend to this inheritance. They are already excluded from succession in civil affairs, and consequently can still less expect it in political: in general, the Asiatic governments are too turbulent, and their administration renders military talents too necessary, to admit of the sovereignty of women. Among the Druzes, the male line of any family being extinguished, the government devolves to him who is in possession of the greatest number of suffrages and resources. But the first step is to obtain the approbation of the Turks, of whom he becomes the vassal and tributary. It even happens, that, not unfrequently to assert their supremacy, they name the Haken, contrary to the wishes of the nation, as in the case of Ismael Hasbey, raised to that dignity by Djezzar; but this constraint lasts no longer than it is maintained by that violence which gave it birth. The office of the governor is to watch over the good order of the state, and to prevent the Emirs, Shaiks, and villages, from making war on each other: in case of disobedience, he may employ force. He is also at the head of the civil power, and names the Cadis, only always reserving to himself the power of life and death. He collects the tribute, from which he annually pays to the pacha a stated sum. This tribute varies in proportion as the nation renders itself more or less formidable: at the beginning of this century, it amounted to 160 purses, L. 8330; but Melhem forced the Turks to reduce it to 60. In 1784, Emir Yousef paid 80 and promised 90. This tribute, which is called *Miri*, is imposed on the mulberry-trees, vineyards, cotton, and grain. All sown land pays in proportion to its extent; every foot of mulberries is taxed at three medins, or three sols nine deniers (not quite two-pence). A hundred feet of vineyard pays a piafter or 40 medins; and fresh measurements are often made to preserve a just proportion. The shaiks and emirs have no exemption in this respect; and it may be truly said they contribute to the public stock in proportion to their fortune. The collection is made almost without expence. Each man pays his contingent at Dair-el-Kamer, if he pleases, or to the collectors of the prince, who make a circuit round the country after the crop of silks. The surplus of this tribute is for the prince; so that it is his interest to reduce the demands of the Turks, as it would be likewise to augment the impost: but this measure requires the sanction of the shaiks, who have the privilege of opposing it. Their consent is necessary, likewise, for peace and war. In these cases, the emir must convoke general assemblies, and lay before them the state of his affairs. There every shaik, and every peasant who has any reputation for courage or understanding, is intitled to give his suffrage; so that this government may be considered as a well-proportioned mixture of monarchy, aristocracy, and democracy. Every thing depends on circumstances.

Druzes.

Druses. ces : if the governor be a man of ability, he is absolute; if weak, a cypher. This proceeds from the want of fixed laws; a want common to all Asia, and the radical cause of all the disorders in the governments of the Asiatic nations.

Neither the chief nor the individual emirs maintain troops; they have only persons attached to the domestic service of their houses, and a few black slaves. When the nation makes war, every man, whether shaik or peasant, able to bear arms, is called upon to march. He takes with him a little bag of flour, a musket, some bullets, a small quantity of powder, made in his village, and repairs to the rendezvous appointed by the governor. If it be a civil war, as sometimes happens, the servants, the farmers, and their friends, take up arms for their patron, or the chief of their family, and repair to his standard. In such cases, the parties irritated frequently seem on the point of proceeding to the last extremities; but they seldom have recourse to acts of violence, or attempt the death of each other; mediators always interpose, and the quarrel is appeased the more readily as each patron is obliged to provide his followers with provisions and ammunition. This system, which produces happy effects in civil troubles, is attended with great inconvenience in foreign wars, as sufficiently appeared in that of 1784. Djezzar, who knew that the whole army lived at the expence of the emir Yousef, aimed at nothing but delay, and the Druzes, who were not displeased at being fed for doing nothing, prolonged the operations; but the emir, wearied of paying, concluded a treaty, the terms of which were not a little rigorous for him, and eventually for the whole nation, since nothing is more certain than that the interests of a prince and his subjects are always inseparable.

"The ceremonies to which I have been a witness on these occasions (says M. Volney), bear a striking resemblance to the customs of ancient times. When the emir and the shaiks had determined on war at Daer-el-Kamar, cryers in the evening ascended the summits of the mountain; and there began to cry with a loud voice: 'To war, to war; take your guns, take your pistols: noble shaiks, mount your horses; arm yourselves with the lance and sabre; rendezvous to morrow at Dair-el-Kamar. Zeal of God! zeal of combats!' This summons, heard from the neighbouring villages, was repeated there; and as the whole country is nothing but a chain of lofty mountains and deep valleys, the proclamation passed in a few hours to the frontiers. These voices, from the stillness of the night, the long resounding echoes, and the nature of the subject, had something awful and terrible in their effect. Three days after 15000 armed men rendezvoused at Dair-el-Kamar, and operations might have been immediately commenced.

"We may easily imagine that troops of this kind no way resemble our European soldiers; they have neither uniforms, nor discipline, nor order. They are a crowd of peasants with short coats, naked legs, and muskets in their hands; differing from the Turks and Mamlouks in that they are all foot; the shaiks and emirs alone having horses, which are of little use from the rugged nature of the country. War there can only be a war of posts. The Druzes never risk themselves in the plain; and with reason: for they would be unable to stand the shock of cavalry, having no bayonets to their muskets. Their whole art consists in climbing rocks, creeping among the bushes and blocks

of stone; from whence their fire is the more dangerous, as they are covered, fire at their ease, and by hunting and military sports have acquired the habit of hitting a mark with great dexterity. They are accustomed to sudden inroads, attacks by night, ambuscades, and all those *coups de main* which require to fall suddenly on, and come to close fight with the enemy. Ardent in improving their success, easily dispirited, and prompt to resume their courage; daring even to temerity, and sometimes ferocious, they possess above all two qualities essential to the excellency of any troops; they strictly obey their leaders, and are endowed with a temperance and vigour of health at this day unknown to most civilized nations. In the campaign of 1784, they passed three months in the open air without tents, or any other covering than a sheep-skin; yet were there not more deaths or maladies than if they had remained in their houses. Their provisions consisted, as at other times, of small loaves baked on the ashes or on a brick, raw onions, cheese, olives, fruits, and a little wine. The table of the chiefs was almost as frugal; and we may affirm, that they subsisted 100 days, on what the same number of Englishmen or Frenchmen would not have lived ten. They have no knowledge of the science of fortification, the management of artillery or encampments, nor, in a word, any thing which constitutes the art of war. But had they among them a few persons versed in military science, they would readily acquire its principles, and become a formidable soldiery. This would be the more easily effected, as their mulberry plantations and vineyards do not occupy them all the year, and they could afford much time for military exercises."

By the last estimates, according to M. Volney's information, the number of men able to bear arms was 40,000, which supposes a total population of 120,000: no addition is to be made to this calculation, since there are no Druzes in the cities or on the coast. As the whole country contains only 110 square leagues, there results for every league 1090 persons; which is equal to the population of our richest provinces. To render this more remarkable, it must be observed that the soil is not fertile, that a great many eminences remain uncultivated, that they do not grow corn enough to support themselves three months in the year, that they have no manufactures, and that all their exportations are confined to silks and cottons, the balance of which exceeds very little the importation of corn from the Hauran, the oils of Palestine, and the rice and coffee they procure from Bairout. Whence arises then such a number of inhabitants within so small a space? "I can discover no other cause (says our author), than that ray of liberty which glimmers in this country. Unlike the Turks, every man lives in a perfect security of his life and property. The peasant is not richer than in other countries; but he is free. 'He fears not,' as I have often heard them say, 'that the Aga, the Kaimmakam, or the Pacha, should send their Djendis to pillage his house, carry off his family, or give him the bastinado.' Such oppressions are unknown among these mountains. Security, therefore, has been the original cause of population, from that inherent desire which all men have to multiply themselves wherever they find an easy subsistence. The frugality of the nation which is content with little, has been a secondary, and not less powerful reason; and a third is the emigration

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emigration of a number of Christian families, who daily desert the Turkish provinces to settle in Mount Lebanon, where they are received with open arms by the Maronites from similarity of religion, and by the Druzes from principles of toleration, and a conviction how much it is the interest of every country to multiply the number of its cultivators, consumers, and allies.

"The comparison which the Druzes often have an opportunity of making between their situation and that of other subjects of the Turkish government, has given them an advantageous opinion of their superiority, which, by a natural effect, has an influence on their personal character. Exempt from the violence and insults of despotism, they consider themselves as more perfect than their neighbours, because they have the good fortune not to be equally debased. Hence they acquire a character more elevated, energetic, and active; in short, a genuine republican spirit. They are considered throughout the Levant as restless, enterprising, hardy, and brave even to temerity. Only 300 of them have been seen to enter Damascus in open day, and spread around them terror and carnage. No people are more nice than they with respect to the point of honour: Any offence of that kind, or open insult, is instantly punished by blows of the kandjur or the musket; while among the inhabitants of the towns, it only excites injurious retorts. This delicacy has occasioned in their manners and discourse a reserve, or, if you will, a politeness, which one is astonished to discover among peasants. It is carried even to dissimulation and falsehood, especially among the chiefs, whose greater interests demand greater attentions. Circumspection is necessary to all, from the formidable consequences of that retaliation of which I have spoken. These customs may appear barbarous to us; but they have the merit of supplying the deficiency of regular justice, which is necessarily tedious and uncertain in these disorderly and almost anarchical governments.

"The Druzes have another point of honour, that of hospitality. Whoever presents himself at their door in the quality of a suppliant or passenger, is sure of being entertained with lodging and food in the most generous and unaffected manner. M. Volney often saw the lowest peasants give the last morsel of bread they had in their houses to the hungry traveller; and when it was observed to them that they wanted prudence, their answer was, 'God is liberal and great, and all men are brethren.' There are, therefore, no inns in their country any more than in the rest of Turkey. When they have once contracted with their guest the sacred engagement of bread and salt, no subsequent event can make them violate it. Various instances of this are related, which do honour to their character. A few years ago, an aga of the janissaries having been engaged in a rebellion, fled from Damascus and retired among the Druzes. The pacha was informed of this, and demanded him of the emir, threatening to make war on him in case of refusal. The emir demanded him of the shaik Talhouk, who had received him; but the indignant shaik replied, 'When you have known the Druzes deliver up their guests? Tell the emir, that as long as Talhouk shall preserve his beard, not a hair of the head of his suppliant shall fall!' The emir threatened him with force; Talhouk armed his

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family. The emir, dreading a revolt, adopted a method practised as juridical in that country. He declared to the shaik, that he would cut down 50 mulberry-trees a-day until he should give up the aga. He proceeded as far as a thousand, and Talhouk still remained inflexible. At length the other shaiks, enraged, took up the quarrel; and the commotion was about to become general, when the aga, reproaching himself with being the cause of so much mischief, made his escape without the knowledge even of Talhouk.

"The Druzes have also the prejudices of the Bedouins respecting birth; like them, they pay great respect to the antiquity of families; but this produces no essential inconveniences. The nobility of the emirs and shaiks does not exempt them from paying tribute in proportion to their revenues. It confers on them no prerogatives, either in the attainment of landed property or public employments. In this country, no more than in all Turkey, are they acquainted with game-laws, or glebes, or seigniorial or ecclesiastical tithes, franc fiefs or alienation fines; every thing is held in freehold: Every man, after paying his miri and his rent, is master of his property. In short, by a particular privilege, the Druzes pay no fine for their succession; nor does the emir, like the sultan, arrogate to himself original and universal property: there exists, nevertheless, in the law of inheritance, an imperfection which produces disagreeable effects. Fathers have, as in the Roman law, the power of preferring such of their children as they think proper: hence it has happened in several families of the shaiks, that the whole property has centered in the same person, who has perverted it to the purpose of intriguing and caballing, while his relations remain, as they well express it, *princes of olives and cheese*; that is to say, poor as peasants.

"In consequence of their prejudices, the Druzes do not choose to make alliances out of their own families. They invariably prefer their relation, though poor, to a rich stranger; and poor peasants have been known to refuse their daughters to merchants of Saide and Bairout, who possessed from twelve to fifteen thousand piastres. They observe also, to a certain degree, the custom of the Hebrews, which directed that a brother should espouse his brother's widow; but this is not peculiar to them, for they retain that as well as several other customs of that ancient people, in common with other inhabitants of Syria and all the Arab tribes.

"In short, the proper and distinctive character of the Druzes is a sort of republican spirit, which gives them more energy than any other subjects of the Turkish government, and an indifference for religion, which forms a striking contrast with the zeal of the Mahometans and Christians. In other respects, their private life, their customs and prejudices, are the same with other orientals. They may marry several wives, and repudiate them when they choose; but, except by the emir and a few men of eminence, that is rarely practised. Occupied with their rural labours, they experience neither artificial wants, nor those inordinate passions which are produced by the idleness of the inhabitants of cities and towns. The veil, worn by their women, is of itself a preservative against those desires which are the occasion of so many evils in society.

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ciety. No man knows the face of any other woman than his wife, his mother, his sister, and sisters-in-law. Every man lives in the bosom of his own family, and goes little abroad. The women, those even of the shaiks, make the bread, roast the coffee, wash the linen, cook the victuals, and perform all domestic offices. The men cultivate their lands and vineyards, and dig canals for watering them. In the evening they sometimes assemble in the court, the area, or house of the chief of the village or family. There, seated in a circle, with legs crossed, pipes in their mouths, and poniards at their belts, they discourse of their various labours, the scarcity or plenty of their harvests, peace or war, the conduct of the emir, or the amount of the taxes; they relate past transactions, discuss present interests, and form conjectures on the future. Their children, tired with play, come frequently to listen; and a stranger is surprised to hear them, at ten or twelve years old, recounting, with a serious air, why Djeddar declared war against the emir Yousef, how many purses it cost that prince, what augmentation there will be of the miri, how many muskets there were in the camp, and who had the best mare. This is their only education. They are neither taught to read the psalms as among the Maronites, nor the koran like the Mahometans; hardly do the shaiks know how to write a letter. But if their mind be destitute of useful or agreeable information, at least it is not pre-occupied by false and hurtful ideas; and, without doubt, such natural ignorance is well worth all our artificial folly. This advantage results from it, that their understandings being nearly on a level, the inequality of conditions is less perceptible. For, in fact, we do not perceive among the Druzes that great distance which, in most other societies, degrades the inferior, without contributing to the advantage of the great. All, whether shaiks or peasants, treat each other with that rational familiarity, which is equally remote from rudeness and servility. The grand emir himself is not a different man from the rest: he is a good country gentleman, who does not disdain admitting to his table the meanest farmer. In a word, their manners are those of ancient times, and of that rustic life which marks the origin of every nation; and prove that the people among whom they are still found are as yet only in the infancy of the social state."

DRUSIUS (John), a Protestant writer of great learning, born at Oudenarde in Flanders in 1555. He was designed for the study of divinity; but his father being outlawed, and deprived of his estate, they both retired to England, where the son became professor of the oriental languages at Oxford: but upon the pacification of Ghent, they returned to their own country, where Drusus was also appointed professor of the oriental languages. From thence he removed to Friesland, where he was admitted Hebrew professor in the university of Franeker; the functions of which he discharged with great honour till his death in 1616. His works show him to have been well skilled in Hebrew; and the States General employed him in 1600 to write notes on the most difficult passages in the Old Testament, with a pension of 400 florins a-year: but being frequently disturbed in this undertaking, it was not published till after his death. He held a vast correspondence with the learned; for besides letters in He-

brew, Greek, and other languages, there were found 2300 Latin letters among his papers. He had a son John, who died in England at 21, and was a prodigy for his early acquisition of learning; he wrote Notes on the Proverbs of Solomon, with many letters and verses in Hebrew.

DRYADS, in the heathen theology, a sort of deities, or nymphs, which the ancients thought inhabited groves and woods. They differed from the Hamadryades; these latter being attached to some particular tree, with which they were born, and with which they died; whereas the Dryades were goddesses of trees and woods in general. See HAMADRYADES.

DRYAS, in botany: A genus of the polygynia order, belonging to the icofandria class of plants; and in the natural method ranking under the 35th order, *Senticosæ*. The calyx is octofid; the petals eight; the seeds long and hairy with a train.

DRYDEN (John), one of the most eminent English poets of the 17th century, descended of a genteel family in Huntingdonshire, was born in that county at Oldwinckle 1631, and educated at Westminster school under Dr Bushby. From thence he was removed to Cambridge in 1650, being elected scholar of Trinity-college, of which he appears, by his *Epithalamia Cantabrigiense*. 4to, 1662, to have been afterwards a fellow. Yet in his earlier days he gave no extraordinary indication of genius; for even the year before he quitted the university, he wrote a poem on the death of Lord Hastings, which was by no means a presage of that amazing perfection in poetical powers which he afterwards possessed.

On the death of Oliver Cromwell he wrote some heroic stanzas to his memory; but on the Restoration, being desirous of ingratiating himself with the new court, he wrote first a poem intitled *Astræa Redux*, and afterwards a panegyric to the king on his coronation. In 1662, he addressed a poem to the lord chancellor Hyde, presented on New Year's day; and in the same year a satire on the Dutch. In 1668 appeared his *Annus Mirabilis*, which was an historical poem in celebration of the duke of York's victory over the Dutch. These pieces at length obtained him the favour of the crown; and Sir William Davenant dying the same year, Mr Dryden was appointed to succeed him as poet laureat. About this time also his inclination to write for the stage seems first to have shown itself. For besides his concern with Sir William Davenant in the alteration of Shakespeare's *Tempest*, in 1669 he produced his *Wild Gallants*, a comedy. This met with very indifferent success; yet the author, not being discouraged by its failure, soon published his *Indian Emperor*. This finding a more favourable reception, encouraged him to proceed; and that with such rapidity, that in the key to the Duke of Buckingham's *Rehearsal* he is recorded to have engaged himself by contract for the writing of four plays per year; and, indeed, in the years 1679 and 1680 he appears to have fulfilled that contract. To this unhappy necessity that our author lay under, are to be attributed all those irregularities, those bombastic flights, and sometimes even puerile exuberances, for which he has been so severely criticised; and which, in the unavoidable hurry in which he wrote, it was impossible he should find time either for lopping away or correcting.

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In 1675, the Earl of Rochester, whose envious and malevolent disposition would not permit him to see growing merit meet with its due reward, and was therefore sincerely chagrined at the very just applause with which Mr Dryden's dramatic pieces had been received, was determined if possible to shake his interest at court; and succeeded so far as to recommend Mr Crowne, an author by no means of equal merit, and at that time of an obscure reputation, to write a mask for the court, which certainly belonged to Mr Dryden's office as poet laureat.—Nor was this the only attack, nor indeed the most potent one, that Mr Dryden's justly acquired fame drew on him. For, some years before, the Duke of Buckingham, a man of not much better character than Lord Rochester, had most severely ridiculed several of our author's plays in his admired piece called the *Rehearsal*. But though the intrinsic wit which runs through that performance cannot even to this hour fail of exciting our laughter, yet at the same time it ought not to be the standard on which we should fix Mr Dryden's poetical reputation, if we consider, that the pieces there ridiculed are not any of those looked on as the *chef d'œuvres* of this author; that the very passages burlesqued are frequently, in their original places, much less ridiculous than when thus detached, like a rotten limb, from the body of the work; and exposed to view with additional distortions, and divested of that connection with the other parts, which, while preserved, gave it not only symmetry but beauty; and lastly, that the various inimitable beauties, which the critic has sunk in oblivion, are infinitely more numerous than the deformities which he has thus industriously brought forth to our more immediate inspection.

Mr Dryden, however, did not suffer these attacks to pass with impunity; for in 1679 there came out an Essay on Satire, said to be written jointly by that gentleman and the Earl of Mulgrave, containing some very severe reflections on the Earl of Rochester and the Duchesse of Portsmouth, who, it is not improbable, might be a joint instrument in the above-mentioned affront shown to Mr Dryden; and in 1681 he published his *Abraham and Achitophel*, in which the well-known character of Zimri, drawn for the Duke of Buckingham, is certainly severe enough to repay all the ridicule thrown on him by that nobleman in the character of Bays.—The resentment shown by the different peers was very different. Lord Rochester, who was a coward as well as a man of the most depraved morals, basely hired three ruffians to cudgel Dryden in a coffeehouse: but the Duke of Buckingham, as we are told, in a more open manner, took the task upon himself: and at the same time presented him with a purse containing no very trifling sum of money; telling him, that he gave him the beating as a punishment for his impudence, but bestowed that gold on him as a reward for his wit.

In 1680 was published a translation of Ovid's *Epistles* in English verse by several hands, two of which, together with the preface, were by Mr Dryden; and in 1682 came out his *Religio Laici*, designed as a defence of revealed religion, against Deists, Papists, &c. Soon after the accession of King James II. our author changed his religion for that of the church of Rome, and wrote two pieces in vindication of the Romish tenets; *viz.* A Defence of the Papers written by the late King,

found in his strong box; and the celebrated poem, afterwards answered by Lord Halifax, intitled *The Hind and the Panther*.—By this extraordinary step he not only engaged himself in controversy, and incurred much censure and ridicule from his cotemporary wits; but on the completion of the Revolution, being, on account of his newly-chosen religion, disqualified from bearing any office under the government, he was stripped of the laurel, which, to his still greater mortification, was bestowed on Richard Flecknoe, a man to whom he had a most settled aversion. This circumstance occasioned his writing the very severe poem called *Mac Flecknoe*.

Mr Dryden's circumstances had never been affluent; but now being deprived of this little support, he found himself reduced to the necessity of writing for mere bread. We consequently find him from this period engaged in works of labour as well as genius, *viz.* in translating the works of others; and to this necessity perhaps our nation stands indebted for some of the best translations extant. In the year he lost the laurel, he published the life of St Francis Xavier from the French. In 1693 came out a translation of Juvenal and Persius; in the first of which he had a considerable hand, and of the latter the entire execution. In 1695 was published his prose version of Fresnoy's *Art of Painting*; and the year 1697 gave the world that translation of Virgil's works entire, which still does, and perhaps ever will, stand foremost among the attempts made on that author. The petite pieces of this eminent writer, such as prologues, epilogues, epitaphs, elegies, songs, &c. are too numerous to specify here, and too much dispersed to direct the reader to. The greatest part of them, however, are to be found in a collection of miscellanies in 6 vols 12mo. His last work is what is called his *Fables*, which consists of many of the most interesting stories in Homer, Ovid, Boccace, and Chaucer, translated or modernized in the most elegant and poetical manner; together with some original pieces, among which is that amazing ode on St Cecilia's day, which, though written in the very decline of the author's life, and at a period when old age and distress conspired as it were to damp his poetic ardor and clip the wings of fancy, yet possesses so much of both, as would be sufficient to have rendered him immortal had he never written a single line besides.

Dryden married the lady Elizabeth Howard, sister to the Earl of Berkshire, who survived him eight years; though for the last four of them she was a lunatic, having been deprived of her senses by a nervous fever.—By this lady he had three sons; Charles, John, and Henry. Of the eldest of these there is a circumstance related by Charles Wilson, Esq; in his *Life of Congreve*, which seems so well attested, and is itself of so very extraordinary a nature, that we cannot avoid giving it a place here.—Dryden, with all his understanding, was weak enough to be fond of judicial astrology, and used to calculate the nativity of his children. When his lady was in labour with his son Charles, he being told it was decent to withdraw, laid his watch on the table, begging one of the ladies then present, in a most solemn manner, to take exact notice of the very minute that the child was born; which she did, and acquainted him with it. About a week after, when his lady was pretty well recovered, Mr Dryden took

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Dryden. occasion to tell her that he had been calculating the child's nativity; and observed, with grief, that he was born in an evil hour: for Jupiter, Venus, and the Sun, were all under the earth, and the lord of his ascendant afflicted with a hateful square of Mars and Saturn. "If he lives to arrive at the 8th year," says he, "he will go near to die a violent death on his very birth-day; but if he should escape, as I see but small hopes, he will in the 23d year be under the very same evil direction; and if he should escape that also, the 33d or 34th year is, I fear"—Here he was interrupted by the immoderate grief of his lady, who could no longer hear calamity prophesied to befall her son. The time at last came, and August was the inauspicious month in which young Dryden was to enter into the eighth year of his age. The court being in progress, and Mr Dryden at leisure, he was invited to the country-seat of the Earl of Berkshire his brother-in-law, to keep the long vacation with him in Charleton in Wilts; his lady was invited to her uncle Mordaunt's to pass the remainder of the summer. When they came to divide the children, lady Elizabeth would have him take John, and suffer her to take Charles: but Mr Dryden was too absolute, and they parted in anger; he took Charles with him, and she was obliged to be content with John. When the fatal day came, the anxiety of the lady's spirits occasioned such an effervescence of blood, as threw her into so violent a fever, that her life was despaired of, till a letter came from Mr Dryden, reproving her for her womanish credulity, and assuring her that her child was well; which recovered her spirits, and in six weeks after she received an eclairsissement of the whole affair. Mr Dryden, either through fear of being reckoned superstitious, or thinking it a science beneath his study, was extremely cautious of letting any one know that he was a dealer in astrology; therefore could not excuse his absence, on his son's anniversary, from a general hunting-match which Lord Berkshire had made, to which all the adjacent gentlemen were invited. When he went out, he took care to set the boy a double exercise in the Latin tongue, which he taught his children himself, with a strict charge not to stir out of the room till his return; well knowing the task he had set him would take up longer time. Charles was performing his duty in obedience to his father; but, as ill fate would have it, the stag made towards the house; and the noise alarming the servants, they hastened out to see the sport. One of them took young Dryden by the hand, and led him out to see it also; when, just as they came to the gate, the stag being at bay with the dogs, made a bold push, and leaped over the court-wall, which was very low and very old; and the dogs following, threw down a part of the wall 10 yards in length, under which Charles Dryden lay buried. He was immediately dug out; and after six weeks languishing in a dangerous way, he recovered. So far Dryden's prediction was fulfilled. In the 23d year of his age, Charles fell from the top of an old tower belonging to the Vatican at Rome, occasioned by a swimming in his head with which he was seized, the heat of the day being excessive. He again recovered, but was ever after in a languishing sickly state. In the 33d year of his age, being returned to England, he was unhappily drowned at Windsor. He had with another gentleman swam twice over the Thames; but returning a

third time, it was supposed he was taken with the cramp, because he called out for help, though too late. Thus the father's calculation proved but too prophetic.

At last, after a long life, harassed with the most laborious of all fatigues, viz. that of the mind, and continually made anxious by distress and difficulty, our author departed this life on the first of May 1701.—The day after Mr Dryden's death, the dean of Westminster sent word to Mr Dryden's widow, that he would make a present of the ground and all other abbey-fees for the funeral: the Lord Halifax likewise sent to the lady Elizabeth, and to Mr Charles Dryden, offering to defray the expences of our poet's funeral, and afterwards to bestow 500 l. on a monument in the abbey; which generous offer was accepted. Accordingly, on Sunday following, the company being assembled, the corpse was put into a velvet hearse, attended by 18 mourning coaches. When they were just ready to move, Lord Jefferys, son of Lord Chancellor Jefferys, a name dedicated to infamy, with some of his rakish companions, riding by, asked whose funeral it was; and being told it was Mr Dryden's, he protested he should not be buried in that private manner; that he would himself, with the lady Elizabeth's leave, have the honour of the interment, and would bestow 1000 l. on a monument in the abbey for him. This put a stop to their procession; and the Lord Jefferys, with several of the gentlemen who had alighted from their coaches, went up stairs to the lady, who was sick in bed. His lordship repeated the purport of what he had said below; but the lady Elizabeth refusing her consent, he fell on his knees, vowing never to rise till his request was granted. The lady under a sudden surprise fainted away; and Lord Jefferys, pretending to have obtained her consent, ordered the body to be carried to Mr Russel's an undertaker in Cheapside, and to be left there till further orders. In the mean time the abbey was lighted up, the ground opened, the choir attending, and the bishop waiting some hours to no purpose for the corpse. The next day Mr Charles Dryden waited on the Lord Halifax and the bishop; and endeavoured to excuse his mother, by relating the truth. Three days after, the undertaker, having received no orders, waited on the Lord Jefferys; who pretended that it was a drunken frolic, that he remembered nothing of the matter, and he might do what he pleased with the body. Upon this the undertaker waited upon the lady Elizabeth, who desired a day's respite, which was granted. Mr Charles Dryden immediately wrote to the Lord Jefferys, who returned for answer, that he knew nothing of the matter, and would be troubled no more about it. Mr Dryden hereupon applied again to Lord Halifax and the Bishop of Rochester, who absolutely refused to do any thing in the affair.

In this distress, Dr Garth, who had been Mr Dryden's intimate friend, sent for the corpse to the college of physicians, and proposed a subscription; which succeeding, about three weeks after Mr Dryden's decease, Dr Garth pronounced a fine Latin oration over the body, which was conveyed from the college, attended by a numerous train of coaches to Westminster-abbey, but in very great disorder. At last the corpse arrived at the abbey, which was all unlighted. No organ played,

Dryden. ed, no anthem sung; only two of the singing boys preceding the corpse, who sung an ode of Horace, with each a small candle in their hand. When the funeral was over, Mr Charles Dryden sent a challenge to Lord Jefferys; who refusing to answer it, he sent several others, and went often himself; but could neither get a letter delivered, nor admittance to speak to him: which so incensed him, that finding his Lordship refused to answer him like a gentleman, he resolved to watch an opportunity, and brave him to fight, though with all the rules of honour; which his Lordship hearing, quitted the town, and Mr Charles never had an opportunity to meet him, though he sought it to his death with the utmost application.

Mr Dryden had no monument erected to him for several years; to which Mr Pope alludes in his epitaph intended for Mr Rowe, in this line,

Beneath a rude and nameless stone he lies.

In a note upon which we are informed that the tomb of Mr Dryden was erected upon this hint by Sheffield duke of Buckingham, to which was originally intended this epitaph:

This *Sheffield* rais'd.—The sacred dust below
Was *Dryden* once; the rest, who does not know?

Which was since changed into the plain inscription now upon it, viz.

J. D R Y D E N,

Natus Aug. 9. 1631.

Mortuus Maii 1. 1701.

Johannes Sheffield, dux Buckinghamiensis fecit.

Mr Dryden's character has been very differently drawn by different hands, some of which have exalted it to the highest degree of commendation, and others debased it by the severest censure.—The latter, however, we must charge to that strong spirit of party which prevailed during great part of Dryden's time, and ought therefore to be taken with great allowances. Were we indeed to form a judgment of the author from some of his dramatic writings, we should perhaps be apt to conclude him a man of the most licentious morals; many of his comedies containing a great share of looseness, even extending to obscenity: But if we consider, that, as the poet tells us,

Those who live to please, must please to live;
if we then look back to the scandalous licence of the age he lived in, the indigence which at times he underwent, and the necessity he consequently lay under of complying with the public taste however depraved; we shall surely not refuse our pardon to the compelled writer, nor our credit to those of his cotemporaries who were intimately acquainted with him, and who have assured us there was nothing remarkably vicious in his personal character.

From some parts of his history he appears unsteady, and to have too readily temporized with the several revolutions in church and state. This however might in some measure have been owing to that natural timidity and diffidence in his disposition, which almost all the writers seem to agree in his possessing. Congreve, whose authority cannot be suspected, has given us such an account of him, as makes him appear no less amiable in his private character as a man, than he was illustrious in his public one as a poet. In the former light, according to that gentleman, he was humane, compassionate, forgiving, and sincerely friendly: of an

extensive reading, a tenacious memory, and a ready communication: gentle in the correction of the writings of others, and patient under the reprehension of his own deficiencies: easy of access himself, but slow and diffident in his advances to others; and of all men the most modest and the most easy to be discountenanced in his approaches either to his superiors or his equals. As to his writings, he is perhaps the happiest in the harmony of his numbers, of any poet who ever lived either before or since his time, not even Mr Pope himself excepted. His imagination is ever warm, his images noble, his descriptions beautiful, and his sentiments just and becoming. In his prose he is poetical without bombast, concise without pedantry, and clear without prolixity. His dramatic have, perhaps, the least merit of all his writings. Yet there are many of them which are truly excellent; though he himself tells us that he never wrote any thing in that way to please himself but his *All for Love*. This last, indeed, and his *Spanish Friar*, may be reckoned two of the best plays our language has been honoured with.

DRYPIS, in botany: A genus of the trigynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx is quinque-dentated; the petals five; the opening at the capsule as if cut round horizontally, monospermous.

DUBLIN, the metropolis of Ireland, the second city in his majesty's dominions, and esteemed the fifth for magnitude in Europe, is situated in the province of Leinster, in the county of Dublin, at the bottom of a large bay. The river Liffey, which here disembogues itself into the ocean, divides the town into nearly two equal parts. Formerly the city of Dublin was confined to the south side of the river: it was a place of great antiquity. Ptolemy, who flourished in the reign of Antoninus Pius, about the year 140, says, it was anciently called *Ascheled*. In 155, Alpinus, whose daughter Auliana was drowned in the Liffey, changed the name from *Ascheled* to *Auliana*. It was afterwards named *Dublana*, and Ptolemy calls it *Eblana*. *Dublana*, whence comes *Dublinum* and *Dublin*, is evidently derived from *Dub-leana*, "the place of the black harbour or lake," or rather "the lake of the sea," the bay of Dublin being frequently so called. This city has had a variety of names. The Irish call it *Drom-choll-coil*, "the brow of a hazle wood;" and in 181, Eogan king Munster being on a royal tour, paid a visit to this place, which was then called *Atha Cliath-Dubb-Line*, "the passage of the ford of hurdles over the black pool:" the harbour of Dublin was likewise known by the name of *Lean-Cliath*, or *Leam-Cliath*, from *Lean* or *Leam*, "a harbour;" and from *Cliath* or *Cliabb*, which literally signifies "a hurdle or any thing made of wicker-work;" it also signified certain wires formed with hurdles, and placed in rivers and bays by the ancient Irish for the purpose of taking fish: whence any river or bay wherein these wires were fixed had the name of *Cliath* or *Cliabb* annexed to it, to signify the establishment of a fishery. Dublin, therefore, being originally built on or near one of these harbours, was anciently called *Baly-lean-Cliath*, that is, the town on the fishing harbour. It is described at the present day in the Irish language by the appellations of *Atb-Cliath*, "the ford of hurdles," and *Bally-ath-Cliath*, "the town of the ford."

Drypis.
Dublin.

Dublin. ford of hurdles," the inhabitants having formerly had access to the river by hurdles laid on the low marshy grounds adjoining the water: and this name was also extended to the north side of the river, from a temporary bridge of hurdles thrown over the Anna Liffey, a corruption of *Auin Louiffa*, or "the swift river," so termed from the rapidity of the mountain floods. This side was enlarged by Mac Turkill the Danish prince, who, notwithstanding, fixed his habitation on the south side, and abandoned the northern town; which, from the original country of the invaders, was called *Eastmantown*, since corrupted to *Oxmantown*. King Edgar, in the preface to his charter dated 964, mentions Ireland with its most noble city (*nobilissima civitas*) of *Dublin*. By the Fingallians it is called *Divelin*, and by the Welch *Dinas-Dulin*, or *the city of Duin*.

In 448, Alpin Mac Eachard, king of Dublin and all his subjects, were converted to Christianity by St Patrick.

In the year 498, the Ostmen or Danes having entered the Liffey with a fleet of 60 sail, made themselves masters of Dublin and the adjacent country, and soon after environed the city with walls. About 1170 Dermot Mac Murrough, king of Leinster, having quarrelled with the other princes of the kingdom, a confederacy was formed against him by Roderick O'Connor, monarch of Ireland. Dermot applied to Henry II. king of England, who sent over a number of English adventurers, by whose assistance he was reinstated in his dominions; and in the year 1171, the descendants of the Danes still continuing to hold possession of Dublin, it was besieged and taken by a powerful party of the English under Raymond le Gros. Mac Turkill the Danish king escaped to his shipping: he returned, however, soon after with a strong fleet to recover the city, but was killed in the attempt, and in him ended the race of easterling princes in Ireland.

In 1172, Henry II. landed at Waterford, and obtained from Richard earl of Strongbow (who married the daughter of Dermot Mac Murrough, and by compact was his successor) a surrender of the city of Dublin, where he built a pavilion of wicker work near St Andrew's church, then situated where Castlemarket lately stood, and there entertained several Irish princes, who voluntarily submitted to him, on condition of being governed by the same laws as the people of England. Henry also held a parliament here. In 1173 he granted his first charter to Dublin, and by divers privileges encouraged a colony from Bristol to settle here.

In 1210, upwards of 20 Irish princes swore allegiance to king John at Dublin; engaging to establish the English laws and customs in the kingdom; and in the same year courts of judicature were instituted. In 1216, magna charta was granted to the Irish by Henry III. an entry of which was made in the red book of the exchequer at Dublin. In 1217, the city was granted to the citizens in fee farm at 200 marks *per annum*; and in 1227 the above monarch ordained that the charter granted by king John should be kept inviolably. In 1404, the statutes of Kilkenny and Dublin were confirmed in a parliament held at this city under the earl of Ormond. The charter of the city of Dublin was renewed in 1609, by James I.

The civil government of the city was anciently un-

der the management of a provost and bailiffs; in 1308, John le Decer was appointed the first provost, and Richard de St Olave and John Stakebold bailiffs. In 1409, the title of the chief magistrate was changed to that of mayor, when Thomas Cusack was appointed to the office, Richard Bove and Thomas Shortall being bailiffs: the office of bailiffs was changed to sheriffs in 1547. In 1660, Charles II. gave a collar of SS. and a company of foot guards to the mayor; and in 1665, this monarch conferred the title of lord mayor on the chief magistrate, to whom he also granted 500*l. per annum* in lieu of the foot company. Sir Daniel Bellingham was the first lord mayor of Dublin; Charles Lovet and John Quelfh were sheriffs the same year. In 1672, Arthur earl of Essex introduced new rules for the better government of the city; and in 1683 the Tholsel was built, for the purpose of the magistrates meeting to hold their courts, assemblies, &c.

Dublin. In the 10th century, after the fortifications of Dublin were repaired by the Ostmen, the walls of the city, including those of the castle, did not occupy more than an Irish mile; they extended from Winetavern-gate to Audeon's-arch, and were continued from thence to where Newgate formerly stood; and from a plan published by John Speed in 1610, it appears that they were continued to Ormond's-gate, or, as it has been since called, *Wormwood-gate*, from thence to the Old-bridge, and along the banks of the river to a very large portal called *Newman's tower*, nearly in the present site of the south entrance of Essex-bridge; and from Newman's tower in an angular direction to Dame's-gate, at the west-end of Dame-street. From the gate at the south-west angle of the castle the wall ran to Nicholas-gate, and was continued from thence to Newgate. The principal streets without the walls were, on the west, New-row, Francis-street, Thomas-street, and James's-street; on the south were Patrick-street, Bride-street, and Ship-street; and on the east Dame-street, George's-lane, and Stephen-street. That space of ground now occupied by Crane-lane, Temple-bar, Fleet-street, Lazar's-hill, or, as it is now called *South Townsend-street*, Crampton, Aston's, George's, and Sir John Roger-son's quays, &c. was then overflowed by the Liffey. On the north side of the river there were only Church-street, Mary's-lane, Hammond-lane, and Pill-lane, then built but on one side as far as Mary's-abbey, which terminated the extent of that part of the town to the eastward; Grange-Gorman, Stoney-batter, now called *Manor-street*, and Glassmanogue, were then villages at some distance from the city; and at the latter the sheriffs have held their courts in times of the plague, as being remote from the stage of infection. In 1664, the inhabitants being numbered amounted to 2565 men and 2986 women, protestants; and 1202 men and 1406 women, Roman catholics, making in the whole 8159.

By comparing this account of the ancient state and boundaries of the metropolis with the following description of its present extent, population, and magnificence, an idea will be readily formed of the amazing increase and improvement it hath experienced within the present century.

Dublin is seated in view of the sea on the east, and a fine country which swells into gently rising eminences

Dublin. nences on the north and west, while it towers boldly up in lofty mountains that bound the horizon on the south. The city itself cannot be seen to full advantage on entering the harbour: but the approach to it from thence exhibits a fine prospect of the country for improvement and cultivation, interspersed with numerous villas, that have a most agreeable effect to enliven this delightful scene, which, beginning at the water's edge, is continued all over the coast to the northward of the bay as far as the eye can reach, and is finely contrasted by a distant view of the Wicklow mountains to the south, where the conical hills, called the *Sugar-loaves*, contribute not a little, by the singularity of their appearance, to embellish the landscape, so extensive and picturesque as not to be equalled by any natural scenery in Europe, but the entrance of the bay of Naples, to which it bears a very striking resemblance.

The form of Dublin is nearly a square, a figure that includes the largest area proportioned to its circumference. From the royal hospital at Kilmainham, at the western extremity of the town, to the east end of Townsend-street, the length is two miles and an half, and its greatest breadth is computed to be of the same extent: hence the city is about 10 miles in circumference. Its increase within the last twenty years has been amazing: it now contains about 22,000 houses, whose inhabitants are estimated at 156,000.

Dublin, with respect to its streets, bears a near resemblance to London. Some of the old streets were formerly narrow: but this defect is now in a great measure remedied by an act of parliament, passed in 1774, for opening the public avenues, taking down sign-posts, palisades, pent-houses, &c. new paving the streets, and flagging the foot passages: and, in 1785, another act passed for the better paving, cleansing, and lighting the city; in consequence of which an additional number of globes with double burners were put up at the distance of 36 feet from each other. These necessary improvements contribute exceedingly to the beauty and convenience of the metropolis: the new streets are wide and commodious, the houses lofty, uniform, and elegant; nor are several of the old streets totally deficient in these respects: Sackville-street, or the Mall, which, though built upwards of 40 years ago, has been included in the number of our new streets by all the late geographers (a self-evident proof that these writers had not even seen the city), is a noble avenue, with a gravel walk in the centre, enclosed by a wall of about three feet high; this walk is 36 feet and a half broad, and the distance between it and the palisades fronting the houses, on either side, is 42 feet and a half: when the new custom-house is completed, this street will be then a most desirable situation for wholesale merchants, not only on account of its proximity to that building, but its great depth in the rear. Some years ago, it was esteemed one of the finest public avenues in Europe: many of the new streets, however, in this city are now much superior to it in the magnificence and uniformity of the houses. Among these, on the north side of the river, in the same quarter with Sackville-street, are Gardiner's-row, north Great George's-street, Cranby-row, Cavendish-row, and Palace-row: the last three form a superb square, having the garden of the lying-in-hospital in the

Dublin. centre: the old wall that encompassed the garden has been lately taken down; there is now a full view of this delightful spot surrounded with iron palisades, and upward of 100 globes with double burners disposed at equal distances, which, added to the globes from the surrounding houses, have a most brilliant effect. This square, which, for its size, is not perhaps to be equalled, has lately received the name of Rutland-square, in compliment to his grace the present duke of Rutland, who contributed munificently towards the improvements in the enclosure of the new garden, and the erecting an elegant edifice for a ball and supper rooms, now nearly finished, situated to the east of the hospital.

Among the new streets and buildings on the south side of the river, those wherein persons of distinction reside, lie chiefly to the eastward of the college and Stephen's-green; which last, though it does not rank with the new buildings, possesses much grandeur and elegance, being one of the largest squares in Europe: it is an English mile in circumference, surrounded by a gravel walk planted on each side with trees; within this walk is a smooth level meadow, having in the centre an equestrian statue of the late king: there are several fine edifices, though almost all differing in the style of their architecture; this variety, however, is esteemed by many rather a beauty than a defect: but, besides the other streets and buildings in this quarter, there is a new square which will be nearly as extensive as Stephen's-green, called *Merion-square*; it was laid out some years ago, by the late lord Fitzwilliam; the buildings are now considerably advanced, and great encouragement has been given by the present noble proprietor: the houses on the north side, which is quite finished, are uniform and lofty; most of them, being carried up with hewn stone to the first story, gives the whole an air of strength, beauty, and magnificence. At the south west angle of Stephen's-green, a new street has been also opened, called *Harcourt-street*, in which are several elegant structures that merit notice, particularly the town residence of the right honourable lord Earlsford.

The principal entrance to the walks of Stephen's-green is on the west side opposite the end of York-street (which may be properly classed among the new streets), as all the old houses have been pulled down and modern buildings erected in their room. Those parts of the city inhabited by merchants and traders begin to wear a new face; and amongst this number the new buildings of Dame-street on the south side, exhibit an extensive, uniform, and beautiful range of houses all of an equal height: the shop doors and windows are formed by arches, exactly similar in their construction and ornaments, which are simply elegant: when the other side of this street shall be rebuilt, it may be justly pronounced one of the first trading streets in Europe; and Parliament-street, which was built some years ago, is now nearly equal to any trading street in London.

The river Liffey, being banked in through the whole length of the town, exhibits spacious and beautiful quays, where vessels below the bridge load and unload before the merchants doors and warehouses: it is navigable as far as Essex-bridge. This bridge was first built in 1681, and took its name from the unfortunate

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fortunate earl of Essex, then viceroy of Ireland. It was taken down in 1753, and rebuilt in an elegant form, after the model of Westminster bridge, but much better proportioned, and on a more secure foundation. It has five arches, the buttresses between which support semicircular niches that project from the parapet; there are ballustrades between these niches, and continued to the ends of the bridge, which is commodiously flagged for foot passages; the whole constructed with hewn stone in a very fine taste. There are four bridges besides this over the river; three of which have nothing to recommend them, further than the antiquity of the Old-Bridge, which was erected in this city at a very early period, when it had the name of *Dublin-Bridge*; it was rebuilt in 1428, since which time it received its present title. Bloody-bridge, built in 1671, was originally constructed with wood, and derives its present harsh appellation from an attempt to break it down, wherein four persons were killed. Ormond-bridge was built in 1684, during the Ormond administration. Arran-bridge, now called *Queen's-bridge*, was erected in the same year; but, being destroyed by the floods in 1763, was rebuilt of hewn stone, and finished in 1768. It consists of three arches, with flagged foot passages, stone ballustrades and ornamental decorations, in a handsome light style, admired by every amateur of the arts.

This city has 2 cathedrals, 18 parish churches, 2 chapels of ease, 15 Roman-catholic chapels, 6 meeting-houses for presbyterians, 1 for anabaptists, 4 for methodists, 2 for quakers, a church for French Calvinists, a Danish and a Dutch church, and a Jewish synagogue.

Christ-church, or the Holy Trinity, built in 1038 by Donat bishop of Dublin, to whom Sitricus the son of Amlave king of the Ostmen of Dublin granted the site for that purpose, stands on the summit of the rising ground at the head of Winetavern-street. It is a venerable Gothic pile; and its present appearance evinces its antiquity. St Patrick's cathedral, first built by archbishop Comyn in 1190, and decorated by archbishop Minot in 1370, with a steeple on which a lofty spire was erected in 1750, is also a fine Gothic structure: it stands on the east side of Patrick-street; the monuments here are more numerous than in Christ-church; and the steeple is the highest in the city.

St Werburgh's church was originally built in a very early age. In 1301, when a great part of the city was consumed by an accidental fire, this church suffered in the conflagration: it was burnt a second time in 1754, and repaired in its present beautiful form in 1759. The front and steeple are admired for their elegance, lightness, and symmetry: the spire is a fine octagon supported by eight pillars; and a gilt ball terminates the whole, being 160 feet from the ground. Catharine's church first built in 1105, and re-edified in its present form in 1769, is situated on the south side of Thomas's-street. St Thomas's church is the latest foundation of the kind in this city, having been begun in the year 1758, and finished and consecrated in 1762. It is situated on the west side of Marlborough-street, opposite Gloucester-street, to which it forms an elegant termination. The other churches in this city are; on the north side of the ri-

ver, Mary's, Michan's, and Paul's; on the south side, Dublin. James's, Luke's, Kevin's, Peter's, Bride's, Nicholas within, Audeon's, Michael's, Mark's, Anne's, John's, and Andrew's; this last is called also the *Round church*, from its form being exactly circular: most, if not all the others were built in an early age: many, however, have been since re-edified, and assumed a more modern form: some of these are not totally devoid of elegance, particularly Anne's. St John's in Fishamble-street was rebuilt in 1773, and has now a handsome front of hewn stone decorated with columns supporting a pediment. Besides these churches, Dublin is adorned with several other public buildings; the most remarkable of which are the following: The castle, the residence of the chief governor, built in 1213 by Henry de Londres, was formerly moated and flanked with towers; but the ditch has been long since filled up, and the old buildings rased, the chapel and wardrobe tower excepted, which still remain: Birmingham tower was rebuilt in 1777, and is now called *Harcourt tower*. The castle at present consists of two courts, the principal of which is an oblong square formed by four ranges of building: within a few years, in the middle of the south range, a handsome edifice called *Bedford tower* has been erected; the front is decorated with a small arcade of three arches, over which is a colonade supporting a pediment, from whence rises an octagon steeple crowned with a small cupola and gilt ball in a light pleasing style. This tower, which fronts the entrance to the viceroy's apartments, is connected with the buildings on each side by two fine gates; over that on the right hand is a statue of Fortitude; and over the left gate, which is the grand portal to the upper court, is the statue of Justice. In the lower court are the treasury and other offices, with military stores, an arsenal and armory for 40,000 men, and a barrack in which a captain's detachment of infantry are stationed. Between this barrack and the arsenal is the castle garden; opposite to which, at the rear of the lord Lieutenant's apartments, is a range of building called the *Garden-front*, erected about the year 1740, finished in mountain stone, ornamented by semicolumn of the Ionic order, and the windows embellished with cornices and architraves, in a fine taste. The ball-room is now titled *St Patrick's Hall*. The viceroy's body guard consists of a captain, two subalterns, and sixty private men, with a subaltern's guard of horse. The parliament house, a most superb structure, is situated on the north side of college-green: it was begun in 1729, finished in 10 years, and cost 40,000l. it is built with Portland stone, and the front formed by a grand portico of Ionic columns in the most finished style of architectural elegance: the internal parts (which have been lately much improved, under the auspices of the present speaker the right honourable John Forster) correspond with its outward magnificence; and the manner in which the inside is lighted is universally admired. The house of commons is an octagon, covered with a dome supported by columns of the Ionic order, that rise from an amphitheatrical gallery ballustraded with iron scroll-work: this room is admirably well adapted to its purpose. The house of lords is an oblong room, spacious and lofty, and ornamented in a superb manner: it is also judiciously adapted for the reception of the august assembly which meet there:

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there: among other decorations are two pieces of tapestry, representing the battle of the Boyne and siege of Derry, allowed to have much merit. By order of both houses of parliament, a grand new front has been lately erected on the east side of this magnificent pile; and preparations are making to front the north and west sides in a similar manner, from a design of Mr Gandon's: thus insulated, the whole will form a suite of senatorial apartments matchless in elegance and convenience.

The College founded by queen Elizabeth in 1591 is situated at the east end of College-green. It is a most beautiful structure, consisting of two spacious squares, the first of which contains the refectory, the old hall and chapel, and the new theatre for lectures and examinations; the front of this last building is finely decorated with Corinthian columns supporting a pediment; and over the front of the old hall, on the east side of this square, a handsome steeple rises crowned with a cupola. In the other square, which consists partly of brick buildings for the students, there is a superb library, extending through its whole length on the south side: behind this square there is a fine park. The west side of the first square, which is built with Portland stone, forms the grand front, upward of 300 feet in length, ornamented with Corinthian pillars and other decorations in a very fine taste. At a small distance to the south side of this front is an elegant edifice in which the provost resides. The printing-office is a neat handsome structure on the north side of the park; and opposite to it is the anatomy house, in which are to be seen the celebrated wax models of the human figure, executed at Paris by M. Douane, purchased by the right honourable the earl of Shelburne, and presented to this university. The college of Dublin is an university in itself, consisting of a provost, vice-provost, 7 senior and 15 junior fellows, and 17 scholars of the house; the number of students is generally about 400: it has also professors in divinity, common and civil law, physic, Greek, modern languages, mathematics, oriental tongues, history and oratory, modern history, natural philosophy, anatomy and surgery, chemistry, and botany. His royal highness the duke of Gloucester is chancellor, and his grace the lord primate of Ireland vice-chancellor: the visitors are the chancellor (or, in his absence, the vice-chancellor) and the archbishop of Dublin.

The Royal Exchange, situated on Cork-hill, was begun in 1769, and opened for business in 1779; the expence, amounting to L.40,000, being defrayed by lottery schemes, conducted by the merchants of Dublin with an integrity that did them honour. The building is nearly a square, having three fronts of Portland stone in the Corinthian order, and crowned in the midst with a fine dome, which is supported on the inside by 12 Composite fluted pillars that form a circular walk in the centre of the ambulatory: above these pillars are 12 circular windows, and the ceiling of the dome, which is ornamented with stucco, in the Mosaic style, has also a large window in the middle that illumines most of the building. Opposite the north entrance, in the circular walk, is a statue of his present majesty George III. in a Roman military habit; it is

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executed in bronze by Van Nost, and elevated on a white marble pedestal: in a niche on the stair-case leading to the coffee-room is a white marble statue of the late Dr Charles Lucas, executed by Smyth. The north front, which commands a fine view of Parliament-street and Essex-bridge, is embellished by a range of six columns and their correspondent pilasters, supporting a grand pediment with a balustrade on each side: a flight of stone steps leads from the street to the entrance, which is by three fine iron-railed gates: the west front varies but little from the north, except in the want of a pediment, and having only three steps ascending to the entrance, the ground on that side being nearly on a level; this front is opposite the east end of Castle-street near the principal entrance to the Castle.

The Hospital for Lying-in-Women, founded by Dr Bartholomew Mosse, and opened in 1757, stands on the north side of Great Britain street. The building is extremely light and elegant; a beautiful steeple rises in the centre, and the wings are formed by semicircular colonnades on each side. Adjoining the east colonnade is the Rotunda, where balls and assemblies are held, and concerts performed, for the benefit of the charity: close to it are now erecting the grand suite of apartments before mentioned. The garden at the rear of the hospital is laid out in a good taste.

The Blue-coat Hospital was founded on the west side of Queen-street by Charles II. in 1670, for educating the children of reduced freemen of the city: but the original building being greatly decayed, was taken down, and the new Blue-coat Hospital, situated in Oxmantown-green, was begun in 1773. The front is enriched by four Ionic columns, supporting a pediment in the centre, over which the steeple rises, embellished with Corinthian and Composite columns in an admired taste. Connected with the front by circular walls ornamented with balustrades and niches, are the school on one side and the church on the other: these form two well proportioned wings; they are of a similar construction; and each is crowned with a small steeple or turret, corresponding with the rest in uniform harmony and beauty.

The Barracks, the foundation of which was laid in 1704, are esteemed the largest and most commodious in Europe. They consist of four squares, situated at the west end of the town, on the north side of the river. The royal square in the centre, with the horse barrack and the little square on each side, form a spacious and extensive front to the south: the palatine, now called the new square, is opposite to Oxmantown-green; it has been lately rebuilt with hewn stone in a very elegant manner.

The Royal Hospital at Kilmainham for the support of invalids of the Irish army was founded by king Charles II. on a plan similar to that of Chelsea in England. The building was completed in 1683, and cost upwards of L.23,500. It is situated at the west end of the town on a rising ground near the south side of the river, from whence there is an easy ascent to it through several rows of tall trees. This edifice is of a quadrangular form, inclosing a spacious area handsomely laid out in grass-plots and gravelled walks: an arcade is carried along the lower story in each square to the entrance of the hall and chapel, which are both

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curiously

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Dublin. curiously decorated; in the former are several whole-length portraits of royal personages and other distinguished characters.

Dr Stevens's Hospital, the foundation of which was laid in 1720, is a neat quadrangular building, pleasantly situated on the banks of the river near the west end of James's street, from whence a gravelled walk leads by a gentle descent to the entrance of the hospital, and is continued from thence to the water's edge.

The Linen-hall, at the north end of Linen-hall street, which was opened at the public expence in 1728 for the reception of linen cloths brought to the Dublin market, is a handsome building, lately enlarged with treble its number of former rooms, which furnish a new proof of commercial prosperity.

The New Prison in Green-street, the first stone of which was laid in 1773, is a large quadrangular structure, designed and executed under the direction of the late Mr Cooley. The east front consists of a centre break of mountain stone rusticated and crowned by a pediment, with a plain facade of black limestone on each side; and at the external angles of the building are four round towers.

There are many other public edifices in this city and its environs which merit particular notice. The Hospital for Lunatics in west Bow-lane, founded by Dean Swift, and opened in 1757; the Hibernian School in the Phoenix Park, and the Marine School on Sir John Rogerson's Quay, the first for educating the poor children of soldiers, and the other for bringing up to the sea service the sons of deceased or disabled seamen; the Hospital for Incurables in south Townsend-street; Mercer's Hospital in Stephen-street; the Meath Hospital on the Coombe; and Simpson's Hospital in Great Britain street, the last of which was established for the reception of blind and gouty men; are all handsome edifices constructed of hewn stone in the modern style.

To these public buildings may be added St Nicholas's Hospital in Francis-street; the Infirmary for sick and wounded soldiers of the army, and the Foundling Hospital in James's-street; the Magdalen Asylum in Leeson-street; and the House of Industry in Channel-row; the halls for corporations (particularly the Weavers Hall on the Coombe, over the entrance of which is a statue of his late majesty George II.); the Tholsel; the old Four Courts; the old Customhouse; and several others. The Charitable Infirmary, which was first opened in 1728 and rebuilt in 1741, stood on the Inn's Quay, but has lately been pulled down, together with most of the houses on that quay, where the new courts of justice are to be erected: and the benefits of this humane institution are now dispensed to the public at a house taken for that purpose in Jervis-street. The new courts of justice, which will be a principal ornament to the metropolis, are from a design of Mr Gandon's, as is also the new Customhouse, now nearly finished on the north wall. This front extends 375 feet, enriched with arcades and columns of the Doric order, crowned with an entablature: the centre has a portico finished with a pediment, in which is a bas-relief of emblematical figures alluding to commerce: over the pediment is an attic story; and a magnificent dome finishes the centre, whereon is a pedestal supporting a statue of Commerce: the key-stones over the entrances and in the centre of the pavilions are deco-

rated with emblematical heads representing the produce of the principal rivers of Ireland: the south or front to the river, with the arms of Ireland over each pavilion, is of Portland stone: the whole, being formed of large and striking parts, adds much to the picturesque scene of the river, and will remain a lasting monument of reputation to the several artists employed in this superb building.

The playhouses, considered as public buildings, have nothing to recommend them to notice. One only, viz. the old house, now the theatre-royal, in Smock-alley, is kept open by Mr Daly; who, in consequence of the bill passed last session of parliament for the regulation of the stage, enjoys the exclusive privilege of managing and directing the theatrical exhibitions in this metropolis. The playhouse in Crow-street, which formerly possessed the distinction of theatre-royal, has been shut up these several years past.

But a minute description of every public edifice would occupy more room than this publication admits, not to mention the several private houses, justly admired for their elegance. Among these are:

Leinster-house, the town residence of his grace the Duke of Leinster. The entrance to this princely mansion is from Kildare-street, through a grand gateway of rustic stone work, into a spacious court which forms a segment of a circle before the principal front. The inside of this magnificent structure is equal to its exterior appearance; the hall lofty and noble; and the apartments decorated and furnished in a splendid taste, and enriched with several very valuable paintings. The garden front, plain yet bold, possesses a pleasing simplicity; the garden is spacious and elegant, with a beautiful lawn in the centre. The whole of this building is inferior to few private edifices in the British dominions.

The Earl of Charlemont's house is finely situated in the middle of Palace-row, on an eminence exactly fronting the centre of the garden at the rear of the Lying-in-Hospital. The front is built with hewn stone brought from Arklow, superior to that of Portland. The inside of this house is superb and convenient: the hall ceiling is supported by columns; some of the apartments are decorated with a select but choice collection of paintings of the best masters; among which are one of Rembrandt's finest pictures, representing Judas repenting and casting the silver pieces on the ground; a portrait of Caesar Borgia, by Titian; and the Lady's Last Stake by Hogarth, &c. &c. The library is esteemed one of the finest apartments in Dublin, and contains a very valuable collection of the best authors. At one end of it is an anti-chamber, with a fine statue in white marble of the Venus de Medicis by Wilton; and at the other end are two small rooms, one a cabinet of pictures and antiquities, the other of medals: it is situated at the rear of the house, and connected with it by a corridor, in which are some handsome statues and Egyptian curiosities.

Dublin, which is the seat of government and of the chief courts of justice, has received many charters and ample privileges from the kings of England since the reign of Henry II. who introduced the English laws into this kingdom. Richard II. erected it into a marquissate in favour of Robert de Vere Earl of Oxford, whom he also created Duke of Ireland. It is an archie-

Dublin.

Dublin.

archiepiscopal see, and returns with the university and the county six members to parliament. The civil government of Dublin is executed by a lord-mayor, recorder, two sheriffs, twenty-four aldermen, and a common council formed of representatives from the twenty-five corporations. Every third year the lord-mayor, in conformity with an old charter, perambulates the bounds of the city and its liberties; and formerly the freemen of the several corporations, armed and mounted on horseback, were accustomed to attend the chief magistrate on this occasion, which was titled riding the franchises: but as this custom was productive of idleness, intoxication, and riots, among the lower orders of the people, it has been of late years very properly laid aside. Besides the silk, woollen, and worsted manufactures carried on in that quarter of the suburbs called the Earl of Meath's Liberty, and which have been considerably improved within these few years, other branches of useful manufacture are establishing in different parts of the metropolis; and though the trade of Dublin has heretofore consisted chiefly in the importation of foreign commodities, yet, now that the restrictions on their woollens and most of their other goods are removed, it is hoped the daily enlargement of their export trade will cause a proportionable increase of national opulence.

Dublin would have had a commodious station for shipping, were it not that the harbour is choaked up with two banks of sand, called the *North and South Bulls*, which prevent vessels of large burden from coming over the bar. This, however, is in some measure remedied by a prodigious work of stone, and piles of wood extending some miles into the bay on the south side, at the end of which there is a lighthouse, beautifully constructed, after a design of the late Mr Smith's. But the port of Dublin is capable of much greater improvement; particularly by turning the course of the river Dodder, building a mole from the north-wall to Ringsend, and clearing the harbour, so as to form a grand basin on the south side for the reception of vessels of all burthens. This work is to be immediately carried into execution, and will no doubt meet every possible encouragement, from that spirit for promoting the national welfare which now prevails throughout this kingdom, and is remarkably conspicuous in the capital, where, among others, are the following public institutions.

The board of trustees for promoting the linen and hempen manufactures, established by act of parliament. The Dublin society, incorporated by charter in the year 1749, for improving husbandry and other useful arts. The royal college of physicians, established in the year 1679 for promoting of medical knowledge. The royal college of surgeons, instituted in the year 1785. The royal Irish academy, for the advancement of science, polite literature, and antiquities, incorporated by letters patent the 28th of January 1786: His majesty is patron, and the chief governor for the time being is visitor. The Hibernian society, for maintaining, educating, and apprenticing, the orphans and children of soldiers in Ireland. The Hibernian marine society, for maintaining, educating, and apprenticing, the orphans and children of decayed seamen in his majesty's navy and the merchants service, also incorporated by royal charter.

Dublin.

But among these public institutions, that of the bank of Ireland must not be omitted: it was established by act of parliament in 1783; and by facilitating the circulation of specie, gives life and vigour to manufactures and commerce. It is conducted under the management of a governor, deputy-governor, and fifteen directors chosen annually from among the subscribers; with this restriction, that five new directors at least must be chosen every year. This bank is kept in Mary's-abbey. There are four other banks in this city under the following firms, *viz.* Right Honourable David La Touche and Co. and Sir William Gleadowe Newcomen, Bart. and Co. both in Castle-street; John Dawson Coates, Esq; Thomas-street; and John Finlay and Co. upper Ormond-quay. The houses in which the first three are kept are structures worthy of notice, particularly that of Sir William Gleadowe Newcomen's, which has been rebuilt with hewn stone, in a good taste, after a design of the late Mr Ivory's.

To these public institutions may be added the General Post-Office of Ireland, established by act of parliament in 1784, previous to which time the post-office of this kingdom was only considered a branch of the English one. The building erected for this purpose is on the south side of College-green: it is a fine lofty extensive structure, and the offices for clerks, &c. are extremely well adapted. There are two post-masters general, a secretary, treasurer, accountant-general, resident surveyor, and comptroller. There is also a penny-post under the direction of the same officers, established for the conveyance of letters to all parts throughout the city and its environs.

Dublin is remarkably well supplied with flesh, fowl, and fish, the latter in much greater perfection than any other capital in Europe. It is supplied with coals chiefly from Cumberland and Scotland; and water is conveyed to the city on the north side from the river Liffey, by machines curiously constructed for the purpose, at an outlet called *Island-bridge*: the south side is supplied with that necessary article from a fine reservoir or basin, surrounded with a wall and a handsome grass walk enclosed on each side by a thick-set hedge and trees planted at equal distances. From one end of it there is a view of the canal for the convenience of inland water carriage, now completed as far as Monastereven, between which and the canal harbour in James's-street, passage-boats ply daily; they are well appointed and accommodated with all necessary refreshments. At a small distance from the basin there is a bridge of a single arch thrown over the canal, the elegance and architecture of which are much admired: the sides of the canal for some miles into the country are planted with elm-trees, which renders its banks in fair weather a delightful place of exercise for the citizens; who also resort for recreation to his majesty's Phoenix-park, a fine extensive enclosure at the west end of the town and on the opposite side of the river to the canal, diversified with woodland, campaign, and rising ground, and well stocked with deer. It is seven miles in circuit; and besides the Hibernian school, is adorned with the viceroy's beautiful villa and some handsome lodges belonging to the rangers: in this park are also a magazine for powder and a battery that commands the city. In 1747, a fluted pillar 30 feet high, with a phoenix on the top, was erected in the

Dublin
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Ducat.

centre of a ring in this park by the celebrated earl of Chesterfield when lord lieutenant of Ireland.

The circular road which surrounds the city, beginning on one side of the river, at the east end of the town, and terminating on the opposite shore, is carried through the park. This road forms a very agreeable ride, and is much frequented. It is the boundary of the jurisdiction of the new police, instituted for the better preservation of the peace and good order of the city and the personal security of its inhabitants. This institution, lately established by act of parliament, is under the direction of a chief commissioner, three assistant commissioners, and four divisional justices, who are all aldermen of the city: which is therefore properly termed *the district of the metropolis*, and divided into four wards. The police-guard consists of 40 horsemen and 400 foot, well armed, and in regular uniform: they are taught military discipline, and stationed at night-time in the several watch-houses; from whence parties are constantly patrolling the streets, and centinels are placed at different stands. This institution is found by experience to be a much more effectual prevention of robberies, riots, and nocturnal outrages, than the parish watches; and to this security which the well disposed working manufacturers enjoy, may in a great measure be attributed that encreasing spirit of industry and peaceable behaviour now so prevalent among this useful class of the community, which cannot fail to be productive of the most salutary consequences to the future welfare of the metropolis and the kingdom in general.

DUBOS (John Baptist), a learned and ingenious French author, born at Beauvais in 1670. He finished his studies at Paris, and at length was intrusted with the management of several important affairs in Italy, England, and Holland. At his return to Paris, he had a prebendary given him; afterwards he had a pension of two thousand livres, and the abbey of Notre Dame at Reffons, near Beauvais. He died at Paris, when perpetual secretary of the French academy, on the 23d of March 1742. His principal works are, 1. Critical Reflections on Poetry and Painting, in three volumes duodecimo. 2. A Critical History of the French Monarchy in Gaul, two volumes 4to.

DUBRIS (anc. geog.), a town of Britain; now Dover, from the *Dovoria* of the lower age. A port town of Kent, opposite to Calais.

DUCAL, in general, something belonging to a duke. See DUKE.

The letters-patent granted by the senate of Venice are called *ducals*: so also are the letters wrote, in the name of the senate, to foreign princes. The denomination of ducal is derived hence; that, at the beginning of such patents, the name of the duke or doge is wrote in capitals, thus, *N—Dei Gratia Dux Venetiarum*, &c. The date of ducals is usually in Latin, but the body is in Italian. A courier was dispatched with a ducal to the emperor, returning him thanks for renewing the treaty of alliance (in 1716), against the Turks, with the republic of Venice.

DUCAS, a learned Greek, who wrote an history of what passed under the last emperors of Constantinople, till the ruin of that city. This work, which is esteemed, was printed at the Louvre in 1649, with the Latin translation and notes of Bouillaud.

DUCAT, a foreign coin, either of gold or silver,

struck in the dominions of a duke; being about the same value with a Spanish piece of eight, or a French crown, or four shillings and sixpence sterling when of silver; and twice as much when of gold. See COIN.

The origin of ducats is referred to one Longinus, governor of Italy; who, revolting against the emperor Justin the Younger, made himself duke of Ravenna, and called himself *Exarcha*, i. e. *without lord or ruler*; and, to show his independence, struck pieces of money of very pure gold in his own name, and with his own stamp, which were called *ducatti*, *ducats*; as Procopius relates the story.

After him, the first who struck ducats were the Venetians, who called them *Zecchini* or *sequins*, from Zecca, the place where they first were struck. This was about the year 1280, in the time of John Danduli: but we have pretty good evidence, that Roger king of Sicily had coined ducats as early as 1240. And Du Cange scruples not to affirm, that the first ducats were struck in the duchy of Apulia in Calabria. The chief gold ducats now current are, the single and double ducats of Venice, Florence, Genoa, Germany, Hungary, Poland, Sweden, Denmark, Flanders, Holland, and Zurich. The heaviest of them weighs 5 pennyweights 17 grains, and the lightest 5 pennyweights 10 grains; which is to be understood of the double ducats, and of the single in proportion.

The Spaniards have no ducats of gold; but, in lieu thereof, they make use of the silver one; which, with them, is no real species, but only a money of account like our pound. It is equivalent to 11 rials. See RIAL. The silver ducats of Florence serve there for crowns.

DUCATOON, a silver coin, struck chiefly in Italy; particularly at Milan, Venice, Florence, Genoa, Lucca, Mantua, and Parma: though there are also Dutch and Flemish ducatoons. They are all nearly on the same footing; and being a little both finer and heavier than the piece of eight, are valued at two pence or three pence more, viz. at about four shillings and eightpence sterling.

There is also a gold ducatoon, struck and current chiefly in Holland: it is equivalent to twenty florins, on the footing of one shilling and eleven pence half-penny the florin.

DUCENARIUS, in antiquity, an officer in the Roman army, who had the command of 2000 men.

The emperors had also ducenarii among their procurators or intendants, called *procuratores ducenarii*. Some say, that these were such whose salary was two hundred sesterces; as in the games of the circus, horses hired for two hundred sesterces were called *ducenarii*. Others hold, that ducenarii were those who levied the two hundredth penny, the officers appointed to inspect the raising of that tribute. In the inscription at Palmyra, the word *ducenarius*, in Greek *δουκηνάριος*, occurs very often.

DUCENTESIMA, in antiquity, a tax of the two hundredth penny, exacted by the Romans.

DUCHAL (James), D. D. a late pious and learned dissenting minister, was born in Ireland, and finished his studies at the university of Glasgow; which afterwards, from a regard to his merit, conferred on him the degree of doctor of divinity. He resided 10 or 11 years at Cambridge, as the pastor of a small congregation there; where he enjoyed his beloved retirement,

Ducat
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Duchal.

Duchy,
Duck.

the advantage of books and of learned conversation, which he improved with the greatest diligence. On Mr Abernethy's removal from Antrim, he succeeded him there; and on that gentleman's death, he succeeded him as minister of the dissenting meeting-house in Wood-street, Dublin. In this situation he continued till his death, which happened on the 4th of May 1761, when he had completed his 64th year. He published a volume of excellent discourses on the presumptive arguments in favour of the Christian religion, and many occasional tracts; and after his death were published a number of his sermons, in three volumes 8vo.

DUCHY, in geography, an appellation given to the dominions of a duke.

Duchy Court, a court wherein all matters belonging to the duchy or county palatine of Lancaster are decided by decree of the chancellor of that court.

The origin of this court was in Henry the IV.'s time, who obtained the crown by deposition of Richard II. and having the duchy of Lancaster, by descent, in right of his mother, became seised thereof as king, not as duke: So that all the liberties, franchises, and jurisdictions of the said county passed from the king, by his great seal, and not by livery or attornment, as the earldom of March, and other possessions, which descended to him by other ancestors than the king's did. Henry IV. by authority of parliament, severed the possessions, liberties, &c. of the said duchy from the crown: but Edward IV. restored them to their former nature.

The officers belonging to this court are, a chancellor, attorney-general, receiver-general, clerk of the court, and messenger; beside the assistants, as an attorney in the exchequer, another in chancery, and four counsellors.

DUCK, in ornithology. See ANAS and DECOY.

This fowl is furnished with a peculiar structure of vessels about the heart, which enables it to live a considerable time under water, as is necessary for it in diving. This made Mr Boyle think it a more proper subject for experiments with the air-pump than any other bird. A full grown duck being put into the receiver of an air-pump, of which she filled one third part, and the air exhausted, the creature seemed to bear it better for the first moments than a hen or other such fowl; but, after about a minute, she showed great signs of uneasiness, and in less than two minutes her head fell down, and she appeared dying, till revived by the letting in of the air. Thus, whatever facility of diving this and other water-fowl may have, it does not appear that they can subsist, without air for respiration, any longer than other animals. A young callow duck was afterwards tried in the same manner, and with the same success, being reduced very near death in less than two minutes. But it is observable, that both birds swelled very much on pumping out the air, so that they appeared greatly larger to the spectators, especially about the crop; it not being intended that any water-fowl should live in an exceedingly rarefied air, but only be able to continue occasionally some time under water. Nature, though she has provided them with the means of this, has done nothing for them in regard to the other.

The strongest instance of these creatures being calculated to live almost in any situation, we have in the

accounts of the blind ducks in the Zirchnitzer lake in Carniola. It is supposed that this lake communicates with another lake under ground in the mountain Savornic, and fills or empties itself according to the fullness or emptiness of that lake; the water of the upper lake running off, and that in vast quantities, by holes in the bottom. The ducks, which are here always in great numbers, are often carried down along with the water, and forced into the subterraneous lake to which it retires. In this unnatural habitation, many of these creatures undoubtedly perish, but some remain alive. These become blind, and lose all their feathers; and in the next filling of the lake, both they and vast numbers of fish are thrown up with the water. At this time they are fat, but make a strange appearance in their naked state, and are easily caught, by reason of their want of sight. In about a fortnight they recover their sight and feathers; and are then of the size of a common wild-duck, but of a black colour, with a white spot in their forehead. When opened, on being taken at their first coming up in their blind state, their stomachs are found full of small fishes, and somewhat resembling weeds. From this it seems, that they cannot be absolutely blind; but that the degree of light to which they have been accustomed in their subterraneous habitation, was sufficient to enable them to procure food for themselves; and their blindness, on coming again into open day-light, is no other than that of a man who has been long in the dark, on having in an instant a large blaze of candles set under his eyes.

Duck (Stephen), originally a thresher in a barn, was born about the beginning of the present century. By his poetical talents he first attracted the notice of some gentlemen at Oxford; and being recommended to Queen Caroline, he, under her patronage, took orders, and was preferred to the living of Byfleet in Surrey. His abilities were, however, much more conspicuous in his primitive station than in his advancement; though, it is said, he was not disliked as a preacher. Falling at length into a low-spirited melancholy way, probably owing to his change of life and cessation from his usual labour, he in a fit of lunacy flung himself into the Thames, in 1756.

DUCKING, plunging in water, a diversion anciently practised among the Goths by way of exercise; but among the Celtæ, Franks, and ancient Germans, it was a sort of punishment for persons of scandalous lives. — At Marseilles and Bourbon their men and women of scandalous life are condemned to the cale, as they call it; that is, to be shut up naked to the shift in an iron cage fastened to the yard of a shallop, and ducked several times in the river. The same is done at Thoulouse to blasphemers.

DUCKING, a sort of marine punishment, inflicted by the French, on those who have been convicted of desertion, blasphemy, or exciting sedition. It is performed as follows: The criminal is placed astride of a short thick batten, fastened to the end of a rope, which passes through a block hanging at one of the yard-arms. Thus fixed, he is hoisted suddenly up to the yard, and the rope being slackened at once, he is plunged into the sea. This chastisement is repeated several times conformable to the purport of the sentence pronounced against the culprit, who has at that time several cannon-shot fastened to his feet during the punishment; which

Duck,
Ducking.

Ducking
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Dudley.

which is rendered public by the firing of a gun, to advertise the other ships of the fleet thereof, that their crews may become spectators.

DUCKING is also a penalty which veteran sailors pretend to inflict on those who, for the first time, pass the tropic of Cancer, the equator, or the straits of Gibraltar, in consequence of their refusal or incapacity to pay the usual fine levied on this occasion.

DUCKING-Stool. See CASTIGATORY.

DUCKUP, at sea, is a term used by the steer'sman, when the main-sail, fore-sail, or sprit-sail, hinders his seeing to steer by a land-mark: upon which he calls out, *Duckup the clew-lines of these sails*; that is, hale the sails out of the way. Also when a shot is made by a chace-piece, if the clew of the sprit-sail hinders the sight, they call out, *Duckup*, &c.

DUCT, in general, denotes any tube or canal. It is a term much used by anatomists.

DUCTILITY, in physics, a property possessed by certain solid bodies, which consists in their yielding to percussion or pressure, and in receiving different forms without breaking.

Some bodies are ductile both when they are hot and when they are cold, and in all circumstances. Such are metals, particularly gold and silver. Other bodies are ductile only when heated to a sufficient degree; such as wax and other substances of that kind, and glass. Other bodies, particularly some kinds of iron, called by the workmen *red-short*, brass, and some other metallic mixtures, are ductile only when cold, and brittle when hot. The degrees of heat requisite to produce ductility in bodies of the first kind, vary according to their different natures. In general, the heat of the body must be such as is sufficient to reduce it to a middle state betwixt solidity and perfect fusion. As wax, for instance, is fusible with a very small heat, it may be rendered ductile by a still smaller one; and glass, which requires a most violent heat for its perfect fusion, cannot acquire its greatest ductility until it is made perfectly red-hot, and almost ready to fuse. Lastly, some bodies are made ductile by the absorption of a fluid. Such are certain earths, particularly clay. When these earths have absorbed a sufficient quantity of water to bring them into a middle state betwixt solidity and fluidity, that is to the consistence of a considerably firm paste, they have then acquired their greatest ductility. Water has precisely the same effect upon them in this respect that fire has upon the bodies above mentioned.

DUDLEY (Edmund), an eminent lawyer and able statesman in the reign of Henry VII.; who with Sir Richard Empson, another lawyer of the same complexion, assisted in filling that rapacious monarch's coffers by arbitrary prosecutions of the people on old penal statutes. They were beheaded on the accession of Henry VIII. to pacify the clamours of the people for justice.

DUDLEY (John), duke of Northumberland, son of the above, a statesman; memorable in the English history for his unsuccessful attempt to place the crown on the head of his daughter-in-law, lady Jane Grey, who fell a victim to his ambition; was born in 1502, and beheaded in 1553. See (*History of*) ENGLAND. Ambrose his eldest son was a brave general and able statesman under queen Elizabeth; and received the ap-

pellation of *the good earl of Warwick*. Henry, the duke's second son, was killed at the siege of St Quintin. Robert, the third son, a man of bad character, was created earl of Leicester; and was one of queen Elizabeth's favourites. His fourth son was the unfortunate lord Guildford Dudley, whose only crime was his being the husband of lady Jane Grey, for which he was beheaded in 1554.

DUDLEY (Sir Robert), as he was called in England, and, as he was styled abroad, *earl of Warwick and duke of Northumberland*, was the son of Robert above mentioned, by the lady Douglas Sheffield; and was born at Sheen in Surry in 1573, where he was carefully concealed, to prevent the queen's knowledge of the earl's engagements with his mother. He studied at Oxford; when his father dying, left him the bulk of his estate. He was at this time one of the finest gentlemen in England; and having a particular turn to navigation, fitted out a small squadron at his own expence, with which he sailed to the river Oroonoke, and took and destroyed nine sail of Spanish ships. In 1595, he attended the earl of Essex, and the lord high admiral of England, in their expedition against the Spaniards; when, for his gallant behaviour at the taking of Cadiz, he received the honour of knighthood. He now endeavoured to prove the legitimacy of his birth, in order to be intitled to his hereditary honours. But being overpowered by the interest of the countess dowager of Leicester, he applied for a licence to travel; and being well received at the court of Florence, resolved to continue there, notwithstanding his receiving a letter of recal; on which his whole estate was seized by king James I. and vested in the crown. He discovered at the court of Cosmo II. great duke of Tuscany, those great abilities for which he had been admired in England, and was at length made chamberlain to his serene highness's consort. He there contrived several methods of improving shipping; introduced new manufactures; and by other services obtained so high a reputation, that at the desire of the archduchess, the emperor Ferdinand, in 1620, created him a duke of the holy Roman empire. He afterwards drained a vast tract of morasses between Pisa and the sea; and raised Leghorn, which was then a mean, pitiful place, into a large and beautiful town, improving the haven by a mole, which rendered it both safe and commodious; and having engaged his highness to declare it a free port, he, by his influence and correspondence, drew many English merchants to settle and set up houses there, which was of very great service to his native country, as well as to the Spaniards. He was also the patron of learned men, and held a high place himself in the republic of letters. His most celebrated work is his *Del Arcano del Mare*, in two volumes, folio.

DUEL, a single combat, at a time and place appointed, in consequence of a challenge. This custom came originally from the northern nations, among whom it was usual to decide all their controversies by arms. Both the accuser and accused gave pledges to the judges on their respective behalf; and the custom prevailed so far amongst the Germans, Danes, and Franks, that none were excused from it but women, sick people, cripples, and such as were under 21 years of age or above 60. Even ecclesiastics, priests, and monks, were

Dudley,
Duel.

Duel. were obliged to find champions to fight in their stead. The punishment of the vanquished was either death, by hanging or beheading; or, mutilation of members, according to the circumstances of the case. Duels were at first admitted not only on criminal occasions, but on some civil ones for the maintenance of rights to estates, and the like: in latter times, however, before they were entirely abolished, they were restrained to these four cases. 1. That the crime should be capital. 2. That it should be certain the crime was perpetrated. 3. The accused must by common fame be supposed guilty. And, 4. The matter not capable of proof by witnesses.

DUEL, at present, is used for single combat on some private quarrel; and must be premeditated, otherwise it is called a *rencounter*. If a person is killed in a duel, both the principals and seconds are guilty, whether the seconds engage or not. (See the article **MURDER**.) It is also a very high offence to challenge a person either by word or letter, or to be the messenger of a challenge, (See **LAW**, n^o clxxxv. 20.)

The general practice of duelling, in this last sense, took its rise in the year 1527, at the breaking up of a treaty between the emperor Charles V. and Francis I. The former desired Francis's herald to acquaint his sovereign, that he would henceforth consider him not only as a base violator of public faith, but as a stranger to the honour and integrity becoming a gentleman. Francis, too high-spirited to bear such an imputation, had recourse to an uncommon expedient to vindicate his character. He instantly sent back the herald with a cartel of defiance, in which he gave the emperor the lie in form, challenged him to single combat, requiring him to name the time and place of the encounter, and the weapons with which he chose to fight. Charles, as he was not inferior to his rival in spirit or bravery, readily accepted the challenge; but after several messages concerning the arrangement of all the circumstances relative to the combat, accompanied with mutual reproaches bordering on the most indecent scurrility, all thoughts of this duel, more becoming the heroes of romance than the two greatest monarchs of their age, were entirely laid aside.

The example of two personages so illustrious, drew such general attention, and carried with it so much authority, that it had considerable influence in introducing an important change in manners all over Europe. Duels, as has already been observed, had been long permitted by the laws of all the European nations; and, forming a part of their jurisprudence, were authorized by the magistrate on many occasions, as the most proper method of terminating questions with regard to property, or of deciding in those which regarded crimes. But single combats being considered as solemn appeals to the omniscience and justice of the Supreme Being, they were allowed only in public causes, according to the prescription of law, and carried on in a judicial form*. Men, accustomed to this manner of decision in courts of justice, were naturally led to apply it to personal and private quarrels. Duels, which at first could be appointed by the civil judge alone, were fought without the interposition of his authority, and in cases to which the laws did not extend. The transaction between Charles and Francis strongly countenanced this practice. Upon every

affront or injury which seemed to touch his honour, a gentleman thought himself intitled to draw his sword, and to call on his adversary to make reparation. Such an opinion, introduced among men of fierce courage, of high spirit, and of rude manners, where offence was often given, and revenge was always prompt, produced most fatal consequences. Much of the best blood in Christendom was shed; many useful lives were lost; and, at some periods, war itself hath hardly been more destructive than these contests of honour. So powerful, however, is the dominion of fashion, that neither the terror of penal laws, nor reverence for religion, have been able entirely to abolish a practice unknown among the ancients, and not justifiable by any principle of reason; though at the same time we must ascribe, in some degree, the extraordinary gentleness and complaisance of modern manners, and that respectful attention of one man to another, which at present render the social intercourses of life far more agreeable and decent than among the most civilized nations of antiquity.

Public opinion is not easily controlled by civil institutions; for which reason it may be questioned whether any regulations can be contrived of sufficient force to suppress or change the rule of honour which stigmatizes all scruples about duelling with the reproach of cowardice.

The inadequate redress which the law of the land affords for those injuries which chiefly affect a man in his sensibility and reputation, tempts many to redress themselves. Prosecutions for such offences, by the trifling damages that are recovered, serve only to make the sufferer more ridiculous.—This ought to be remedied.

For the army, where the point of honour is cultivated with exquisite attention and refinement, there might be established a court of honour, with a power of awarding those submissions and acknowledgments which it is generally the object of a challenge to obtain; and it might grow into a fashion with persons of rank of all professions to refer their quarrels to the same tribunal.

Duelling, as the law now stands, can seldom be overtaken by legal punishment. The challenge, appointment, and other previous circumstances, which indicate the intention with which the combatants met, being suppressed, nothing appears to a court of justice but the actual *rencounter*; and if a person be slain when actually fighting with his adversary, the law deems his death nothing more than manslaughter.

DUERO, or **DURO**, a large river, which, rising in Old Castile in Spain, runs from east to west, crosses the province of Leon, and after dividing Portugal from Spain by a southerly course, turns westward, crosses Portugal, and falls into the Atlantic Ocean at Porto-Port.

DUGDALE (Sir William), an eminent English historian, antiquarian, and herald, born in Warwickshire in 1605. He was introduced into the herald's office by Sir Christopher Hatton; and ascended gradually through all the degrees, until he became garter principal king at arms. His chief work is the *Monasticon Anglicanum*, in three vols folio; containing the charters and descriptions of all the English monasteries, adorned with engravings: in the former part of which

Duel
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Dugdale.

* See the
article
Buttel.

Duillia
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Duke.

work he was assisted by Mr Roger Dodsworth. Nor are his Antiquities of Warwickshire less esteemed. He wrote likewise, among other things of less note, the History of St Paul's Cathedral; a History of Embanking and Draining; a Baronage of England; and completed the second volume of Sir Henry Spelman's Councils, with a second part of his Glossary. He died in 1686. His son, Sir John, was Norroy king at arms, and published a Catalogue of English Nobility. His daughter Elizabeth married the famous Elias Ashmole.

DUILLIA LEX, was enacted by M. Duillius, a tribune, in the year of Rome 304. It made it a capital crime to leave the Roman people without its tribunes, or to create any new magistrate without a sufficient cause. Another in 392, to regulate what interest ought to be paid for money lent.

C. DUILLIUS NEPOS, a Roman consul, the first who obtained a victory over the naval power of Carthage in the year of Rome 492. He took fifty of the enemy's ships, and was honoured with a naval triumph, the first that ever appeared at Rome. The senate rewarded his valour by permitting him to have music playing and torches lighted at the public expence every day while he was at supper. There were some medals struck in commemoration of this victory; and there exists a column at Rome which was erected on the occasion.

DUKE, *Dux*, a sovereign prince, without the title or quality of king. Such are the Duke of Lorraine, of Holstein, Savoy, of Parma, &c. The word is borrowed from the modern Greeks, who call *doucas* what the Latins call *dux*.

There are also two sovereigns who bear the title of *grand-duke*; as the grand-duke of Tuscany, and the grand-duke of Muscovy, now called the *czar* or emperor of Russia. The title of *great duke* belongs to the apparent heir of Russia; and the title of *arch-duke* is given to all the sons of the house of Austria, as that of *arch-duchess* to all the daughters.

DUKE, *Dux*, is also a title of honour or nobility, the next below princes.

The dukedom or dignity of duke is a Roman dignity, denominated *a ducendo*, "leading" or "commanding." Accordingly, the first dukes, *duces*, were the *duces exercituum*, "commanders of armies." Under the late emperors, the governors of provinces in war-time were intitled *duces*. In after times the same denomination was also given to the governors of provinces in time of peace. The first governor under the name of *duke* was a duke of the Marchia Rhætica, or Grisons, whereof mention is made in Cassiodorus; and there were afterwards thirteen dukes in the eastern empire, and twelve in the western. The Goths and Vandals, upon their over-running the provinces of the western empire, abolished the Roman dignities wherever they settled. But the Franks, &c. to please the Gauls, who had long been used to that form of government, made it a point of politics not to change any thing therein: and accordingly they divided all Gaul into duchies and counties; and gave the names sometimes of dukes, and sometimes of counts, *comites*, to the governors thereof.

In England, during the Saxons time, Camden observes, the officers and commanders of armies were called dukes, *duces*, after the ancient Roman manner, N° 105.

without any addition. After the Conqueror came in, the title lay dormant till the reign of Edward III. who created his son Edward, first called the *Black Prince*, duke of Cornwall; which hath ever since been the peculiar inheritance of the king's eldest son during the life of his father; so that he is *dux natus, non creatus*. After whom there were more made, in such manner as that their titles descended to their posterity. They were created with much solemnity, *per cincturam gladii, cappæque, & circuli aurei in capite impositionem*. However, in the reign of Queen Elizabeth, A. D. 1572, the whole order became utterly extinct; but it was revived about 50 years afterwards by her successor, in the person of George Villiers duke of Buckingham.

Though the French retained the names and form of the ducal government, yet under their second race of kings there were scarce any such thing as dukes: but all the great lords were called *counts, peers, or barons*; excepting, however, the dukes of Burgundy and Aquitaine; and the duke of France, which was a dignity Hugh Capet himself held, corresponding to the modern dignity of *maire de palais*, or the king's lieutenant. By the weakness of the kings, the dukes or governors sometimes made themselves sovereigns of the provinces trusted to their administration. This change happened chiefly about the time of Hugh Capet; when the great lords began to dismember the kingdom, so that that prince found more competitors among them than subjects. It was even with a great deal of difficulty they could be brought to own him their superior, or to hold of him by faith and homage. By degrees, what with force, and what by marriages, these provinces, both duchies and counties, which had been rent from the crown, were again united to it. But the title *duke* was no longer given to the governors of provinces. From that time *duke* became a mere title of dignity, annexed to a person and his heirs male, without giving him any domain, territory, or jurisdiction over the place whereof he was duke. All the advantages thereof now consist in the name, and the precedence it gives.

The dukes of our days retain nothing of their ancient splendor but the coronet on their escutcheon, which is the only mark of their departed sovereignty. They are created by patent, cincture of the sword, mantle of state, imposition of a cape; and coronet of gold on the head, and a verge of gold in their hand.

The eldest sons of dukes are by the courtesy of England styled *marquisses*, though they are usually distinguished by their father's second title, whether it be that of *marquis* or *earl*; and the younger sons *lords*, with the addition of their Christian name, as Lord James, Lord Thomas, &c. and they take place of viscounts, though not so privileged by the laws of the land.

A duke has the title of *grace*; and being writ to, he is styled, in the heralds language, *most high, potent, and noble prince*. Dukes of the blood royal are styled *most high, most mighty, and illustrious princes*.

DUKE, among Hebrew grammarians, is an appellation given to a species of accents answering to our comma. See ACCENT.

DUKE-Duke, a quality given in Spain to a grandee of the house of Sylva, on account of his having several duchies from the uniting of two considerable houses in his person. Don Roderigo de Sylva, eldest son of Don

^{li}
Dulcifying Ruy Gomez de Sylva, and heir of his duchies and principalities, married the eldest daughter of the Duke de l'Infantado; in virtue of which marriage, the present Duke de Pastrana, who is descended therefrom, and is grandson of Don Roderigo de Sylva, has added to his other great titles that of duke-duke, to distinguish himself from the other dukes; some whereof may enjoy several duchies, but none so considerable ones, nor the titles of such eminent families.

DULCIFYING, in chemistry, is the sweetening any matter impregnated with salts, by frequently washing it in pure water.

DULL, in the manege. The marks of a dull horse, called by the French *marquis de ladre*, are white spots round the eye and on the tip of the nose, upon any general colour whatsoever. Though the vulgar take these spots for signs of stupidity, it is certain they are great marks of the goodness of a horse; and the horses that have them are very sensible and quick upon the spur.

DULLART (Heiman), a Dutch painter and poet. He was a pupil to Rembrandt, for whose works the few he left are often mistaken. He died in 1684.

DUMBARTON. See DUNBARTON.

DUMBNESS, the privation of the faculty of speech. The most general, or rather the sole cause of dumbness, is the want of the sense of hearing. The use of language is originally acquired by imitating articulate sounds. From this source of intelligence, deaf people are entirely excluded: they cannot acquire articulate sounds by the ear: unless, therefore, articulation be communicated to them by some other medium, these unhappy people must for ever be deprived of the use of language; and as language is the principal source of knowledge, whoever has the misfortune to want the sense of hearing, must remain in a state little superior to that of the brute creation. Deafness has in all ages been considered as such a total obstruction to speech or written language, that an attempt to teach the deaf to speak or read has been uniformly regarded as impracticable, till Dr Wallis and some others have of late shown, that although deaf people cannot learn to speak or read by the direction of the ear, there are other sources of imitation, by which the same effect may be produced. The organs of hearing and of speech have little or no connection. Persons deprived of the former generally possess the latter in such perfection, that nothing further is necessary, in order to make them articulate, than to teach them how to use these organs. This indeed is no easy task; but experience shows that it is practicable. Mr THOMAS BRAIDWOOD, late of Edinburgh, was perhaps the first who ever brought this surprising art to any degree of perfection. He began with a single pupil in 1764; and since that period has taught great numbers of people born deaf to speak distinctly; to read, to write, to understand figures, the principles of religion and morality, &c. At the time we first conversed with him, being a few years after the commencement of his practice, he had a considerable number of deaf pupils, some of them above 20 years of age, all making a rapid and amazing progress in those useful branches of education.

Mr Braidwood's principal difficulty, after he had

discovered this art, was to make people believe in the practicability of it. He advertised in the public papers; he exhibited his pupils to many noblemen and gentlemen; still he found the generality of mankind unwilling to believe him. A remarkable instance of this incredulity occurred some years ago. A gentleman in England sent a deaf girl of his to Mr Braidwood's care. A year or two afterwards, Mr Braidwood wrote to the father, that his daughter could speak, read, and write distinctly. The father returned an answer, begging Mr Braidwood's excuse, as he could not believe it; however, he desired a friend of his, who was occasionally going to Edinburgh, to call at Mr Braidwood, and inquire into the truth of what he had wrote him: he did so; conversed with Mr Braidwood, saw the young lady, heard her read, speak, and answer any questions he put to her. On his return, he told the father the surprising progress his child had made; but still the father thought the whole an imposition: the girl herself wrote to her father, but he looked upon the letter as a forgery. About this time the father died; and the mother sent an uncle and cousin of the deaf lady's from Shrewsbury, in order to be satisfied of the truth. When they arrived, Mr Braidwood told the girl her uncle and cousin were in the parlour; and desired her to go and ask them how they did, and how her mother and other friends did. The friends were astonished, and could hardly credit their own ears and eyes.

When we conversed with Mr Braidwood concerning the nature and method of teaching this wonderful art, he seemed to be very desirous of communicating and transmitting his discovery to posterity; but observed, from the nature of the thing we believe it to be true, that he could not communicate it so fully in writing as to enable any other person to teach it. The first thing in the method is, to teach the pupil to pronounce the simple sounds of the vowels and consonants. We have even seen him performing this operation; but are unable to give a clear idea of it. He pronounces the sound of *a* slowly, pointing out the figure of the letter at the same time; makes his pupil observe the motion of his mouth and throat; he then puts his finger into the pupil's mouth, depresses or elevates the tongue, and makes him keep the parts in that position; then he lays hold of the outside of the windpipe, and gives it some kind of squeeze, which it is impossible to describe: all the while he is pronouncing *a*, the pupil is anxiously imitating him, but at first seems not to understand what he would have him to do. In this manner he proceeds, till the pupil has learned to pronounce the sounds of the letters. He goes on in the same manner to join a vowel and a consonant, till at length the pupil is enabled both to speak and read.

That his pupils were taught not only the mere *pronunciation*, but also to understand the *meaning* of what they read, was easily ascertained by a conversation with any of them. Of this Mr Pennant gives a remarkable instance in a young lady of about 13 years of age, who had been some time under the care of Mr Braidwood. "She readily apprehended (says he) all I said, and returned me answers with the utmost facility. She read; she wrote well. Her reading was not by rote. She could clothe the same thoughts in a new set of words,

Dumbness. and never vary from the original sense. I have forgot the book she took up, or the sentences she made a new version of: but the effect was as follows:

"*Original passage.* Lord Bacon has divided the whole of human knowledge into history, poetry, and philosophy; which are referred to the three powers of the mind, memory, imagination, and reason.

"*Version.* A nobleman has parted the total or all of man's study or understanding into, An account of the life, manners, religion or customs of any people or country; verse or metre; moral or natural knowledge: which are pointed to the three faculties of the soul or spirit; the faculty of remembering what is past, thought or conception, and right judgment."

Mr Braidwood's success since he went to settle in London is universally known. Several other persons have since attempted the same art with various degrees of ability. But a new and different method, equally laborious and successful, we understand, is practised by the Abbé de l'Epee of Berlin. We are informed* that he begins his instructions not by endeavouring to form the organs of speech to articulate sounds, but by communicating ideas to the mind by means of signs and characters: to effect this, he writes the names of things; and, by a regular system of signs, establishes a connection between these words and the ideas to be excited by them. After he has thus furnished his pupils with ideas, and a medium of communication, he teaches them to articulate and pronounce, and renders them not only grammarians but logicians. In this manner he has enabled one of his pupils to deliver a Latin oration in public, and another to defend a thesis against the objections of one of his fellow-pupils in a scholastic disputation; in which the arguments of each were communicated to the other, but whether by signs or in writing is not said; for it does not appear that the Abbé teaches his pupils to discern what is spoken, by observing the motion of the organs of speech, which those instructed by Messrs Braidwoods are able to do with astonishing readiness.

There is perhaps no word, says the Abbé, more difficult to explain by signs than the verb *croire*, "to believe." To do this, he writes the verb with its significations in the following manner:

Je crois { *Je dis oui par l'esprit, Je pense que oui.*
 Je dis oui par le coeur, J'aime à penser que oui.
 Je dis oui par la bouche.
 Je ne vois pas des yeux.

After teaching these four significations, which he does by as many signs, he connects them with the verb, and adds other signs to express the number, person, tense, and mood, in which it is used. If to the four signs, corresponding with the lines above mentioned, he added that of a substantive, the pupil will write the word *foi*, "faith;" but, if a sign, indicating a participle used substantively, be adjoined, he will express *la croyance*, "belief;" to make him write *croyable*, "credible," the four signs of the verb must be accompanied with one that indicates an adjective terminating in *able*; all these signs are rapidly made, and immediately comprehended.

M. Linguet, a member of the Royal Academy, having asserted that persons thus instructed could be considered as little more than automata, the Abbé invited him to be present at his lessons, and expressed his

astonishment that M. Linguet should be so prejudiced *Dumbness.* in favour of the medium by which he had received the first rudiments of knowledge, as to conclude that they could not be imparted by any other; desiring him, at the same time, to reflect, that the connection between ideas and the articulate sounds, by which they are excited in the mind, is not less arbitrary than that between these ideas and the written characters which are made to represent them to the eye. M. Linguet complied with the invitation; and the Abbé having desired him to fix on some abstract term which he would by signs communicate to his pupils, he chose the word *unintelligibility*; which, to his astonishment, was almost instantly written by one of them. The Abbé informed him, that to communicate this word he had used five signs, which, though scarcely perceivable to him, were immediately and distinctly apprehended by his scholars: the first of these signs indicated an internal action; the second represented the act of a mind that reads internally, or, in other words, comprehends what is proposed to it; a third signified that such a disposition is possible; these, taken together, form the word *intelligible*: a fourth sign transforms the adjective into the substantive; and a fifth, expressing negation, completes the word required. M. Linguet afterwards proposed this question, *What do you understand by metaphysical ideas?* which being committed to writing, a young lady immediately answered on paper in the following terms: "I understand the ideas of things which are independent of our senses, which are beyond the reach of our senses, which make no impression on our senses, which cannot be perceived by our senses." On reading this, we cannot help exclaiming with the poet, *Labor omnia vincit improbus!* a maxim by none more forcibly illustrated than by the Abbé de l'Epee.

Periodical DUMBNESS. In the Ephemerides of the Curious, we have an account of a periodical dumbness, which had continued for more than 15 years, and had not gone off at the time the account was wrote. The person was son to an inn-keeper at Jelsing in the duchy of Wirtemberg in Germany. He was one night taken so ill after supper, that he could neither stand nor sit. He continued, for about an hour, oppressed with sickness to such a degree as to be in danger of suffocation. At the expiration of this time he grew better; but, during three months, he was much dejected, melancholy, and, at times, fearful. He was then suddenly struck dumb, and became unable to pronounce the least word, or form the least sound, though he could speak very articulately before. The loss of speech was at first instantaneous, and continued only a few minutes: but the duration of it began to lengthen every day; so that it soon amounted to half an hour, two hours, three hours, and at last to 23 hours, yet without any order. At last the return of speech kept so constant and regular an order, that, for 14 years together, he could not speak except from noon, during the space of one entire hour, to the precise moment of one o'clock. Every time he lost his speech, he felt something rise from his stomach to his throat. Excepting this loss of speech, he was afflicted with no other disorder of any animal function. Both his internal and external senses continued sound: he heard always perfectly well, and answered the questions proposed to him by gestures or writing.

* *Nouv. Mem. de l'Académie Royale, &c. de Berlin, 1785. [Mon. Rev. vol. lxxx. p. 651.]*

Dumferm- writing. All suspicion of deceit was removed by his
line keeping exactly the same hour, though he had no ac-
cess to any instruments by which time can be measured.

Dumfries.

DUMFERMLINE, a parliament-town of Scotland, situated in the county of Fife, 15 miles north-west of Edinburgh: W. Long. 30. 20. N. Lat. 56. 15. Here was formerly a magnificent abbey and palace of the kings of Scotland, in which the princess Elizabeth, daughter of king James VI. and mother of the princess Sophia, from whom the present royal family are descended, was born. In the inn of this town is the marriage bed of James VI. and his queen; it is still entire, and used by strangers who lodge here. This place is noted for a manufactory of figured linen cloth called Diaper. The town gave title of earl to a baronet of the Seton family, which was forfeited in the year 1690.

DUMFRIES, a county in the south of Scotland, comprehending the shire of Nithsdale, the stewartry of Annandale, and the lordship of Eskdale, extends in length from north-west to south-east about 60 miles, and is about 30 miles in breadth where broadest. It is bounded on the south-west by Galloway and part of Kyle; on the north-east by the counties of Roxburgh, Selkirk, and Peebles; on the north-west by Clydesdale; and on the south-east by Solway Frith and the marches between Scotland and England. A great part of the country is mountainous and overspread with heath, well stocked with game of all kinds: but the valleys, through which the Esk, the Annan, the Nith, and other smaller rivers run, are extremely pleasant; and some of them well cultivated and very fertile, and produce oats, barley, and wheat in abundance, both for maintaining the inhabitants and for exportation; while the mountainous parts afford pasture for innumerable flocks of sheep and herds of black cattle, many thousands of which are annually exported to England. In the valleys are several natural woods and some extensive plantations of different kinds of timber. In the division called *Nithsdale*, are the rich lead mines of Wanlockhead, the coal mines of Sanquhar and Cairn-burn, the inexhaustible lime-quarries of Closeburn and Barjarg, and free stone in almost every parish. Annandale has the rich lime-quarries of Kellhead and Comtongan, with plenty of free stone near the towns of Annan and Lochmaben: and in the lower part of Eskdale are lime stone and coal in abundance.

DUMFRIES, the capital of the above mentioned county, a handsome town, situated on a ridge or rising ground on the north-east side of the river Nith, about 10 miles above where it falls into Solway Frith, in N. Lat. 55. 8. 30. Long. W. of Greenwich Observatory, 3. 56. Its ancient name, it is said by some of the Scotch historians, was *Cotiac*; but on what authority we cannot tell. Its present name appears to have been derived partly from its situation, and partly from the monastery of Grey Friars that formerly stood near the head of the street called the *Friar-vennal*, the kitchen of which is all that now remains; being only a corruption of *Drumfriars*, or "the eminence of the friary:" and accordingly, till within these 40 or 50 years, it was always spelt *Drumfries*, and not *Dumfries*, as it is now for the sake of greater softness. Besides the pleasantness of its situation on the side of a beautiful winding river, it is surrounded on all sides with one of the

finest and best cultivated sheets of dale country that one can any where meet with, and the prospect from it terminated at the distance of a few miles, by a continued chain of hills, forming altogether one of the grandest natural amphitheatres perhaps in Britain. There was anciently a strong castle at the south end of the town belonging to the Cummings, lords of Badenoch, of which there are now no remains. Another castle was afterwards built at the north-west end, which was taken down about 70 years ago. On the north-east side of it, at some little distance, are the ruins of a chapel built by K. Robert Bruce, and endowed for a number of priests to say mass for the repose of the soul of Sir Christopher Seaton his brother-in-law, who was taken prisoner by Edward I. at Loch-Urr, and hanged at this place. It is now only employed as a burying place for suicides. It is not certain at what period Dumfries was erected into a royal borough; but it must have been before the middle of the eleventh century, as a grave-stone was discovered some time ago bearing the date of 1079, and mentioning the person buried under it to have been a merchant and burgher of the town: and that it was a place of consequence in the beginning of the fourteenth century, is evident from this circumstance, that Edward II. called the estates of Scotland to meet there in the year 1307. In the above mentioned monastery too, K. Robert Bruce killed his rival Cumming lord of Badenoch, with the assistance of James Lindsay and Roger Kirkpatrick, on the 5th of February 1305. As to the present state of the town, the houses are well built and commodious, the streets spacious, open, and neatly paved. It has two very elegant churches, an episcopal chapel with a fine little organ, besides three meeting-houses belonging to different descriptions of sectaries; a tollbooth; a council-chamber; a trades hall; a meal-market; a strong prison; a correction-house; a large hospital; an infirmary, with apartments for insane patients; a narrow bridge of 9 arches over the river, said to have been built by one of the three daughters and co-heiresses of Alan lord Galloway. A large village, called the *Bridge-end*, stands on the opposite side, and is within the stewartry of Kirkcudbright. The assizes for the county, and for the shire of Galloway and stewartry of Kirkcudbright, are held in the town twice a year. It is also the place for holding the sheriff and commissary courts, the quarter-sessions of the peace, and the courts of the commissioners of supply. It is governed by a provost, three bailies, a dean of guild, and a town-council, composed of merchants and the conveener and deacons of the incorporated trades, of which there are seven, viz. square-men, smiths, weavers, tailors, shoemakers, skimmers, and butchers; all of whom are chosen into their respective offices at Michaelmas annually. The trades got from king James VI. in one of his journeys to England, a small silver tube, like a pistol barrel, called the *silver gun*, with his royal licence to shoot for it every year. At that festival they all appear in arms, and march out of the town under their respective colours, to some convenient place, where they shoot at a mark; and the person that hits or shoots nearest to it, returns to town, marching at the conveener's right hand, with the silver gun tied to his hat with ribbons; after which they conclude the day with a social entertainment. The town has a

Dumfries.

Dumont
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weekly market on Wednesday, with two annual fairs, the first on the Wednesday on or next after the 13th of February, and the other on the Wednesday on or next after the 25th of September. At these fairs vast numbers of horses and black cattle are sold; and no town in Scotland is better provided with all sorts of butcher-meat in their season. But though well situated for fuel at a cheap rate, it has only two manufactures, one for stockings and the other for cottons; but the latter only in its infancy. Its foreign trade for many years has only consisted in timber, iron, and other articles for home consumption. It gives the title of Earl to the chief of the family of Crichton; and is the seat of a presbytery and provincial synod. It contains about 6000 inhabitants.

DUMONT (Francis), a Frenchman; compiler of a general collection of treaties of commerce, alliance, and peace, between the powers of Europe. This collection, with Barbeyrac's, containing the treaties B. C. makes 16 vols folio, very useful for historical writers. Dumont retired to Holland in 1720. The time of his death is uncertain.

DUMOSÆ (from *dumus*, a bush), an order of plants in the *Fragmenta methodi naturalis* of Linnæus, containing the following genera, viz. *Viburnum*, *Tinus*, *Opulus*, *Sambucus*, *Rondeletia*, *Bellonia*, *Cassine*, *Ilex*, *Tomax*, &c.

Plate
CLXV.

DUN, or BURGH, the name of an ancient species of buildings, of a circular form, common in the Orkney and Shetland islands, the Hebrides, and northern parts of Scotland. The latter term points out the founders, who at the same time bestowed on them their natal name of *borg*, "a defence or castle," a Sueo-Gothic word; and the Highlanders universally apply to these places the Celtic name *dun*, signifying a hill defended by a tower, which plainly points out their use. They are confined to the countries once subject to the crown of Norway. With few exceptions, they are built within sight of the sea, and one or more within sight of the other; so that on a signal by fire, by flag, or by trumpet, they could give notice of approaching danger, and yield a mutual succour. In the Shetland and Orkney islands, they are most frequently called *wart* or *wardhills*, which shows that they were garrisoned. They had their wardmadher, or watchman, a sort of centinel, who stood on the top, and challenged all who came in sight. The gackman was an officer of the same kind, who not only was on the watch against surprize, but was to give notice if he saw any ships in distress. He was allowed a large horn of generous liquor, which he had always by him, to keep up his spirits. Along the Orkney and Shetland shores, they almost form a chain; and by that means not only kept the natives in subjection, but were situated commodiously for covering the landing of their countrymen, who were perpetually roving on piratical expeditions. These towers were even made use of as state-prisons; for we learn from Torfæus, that after Sueno had surprized Paul, count of Caithness, he carried him into Sutherland, and confined him there in a Norwegian tower. Out of our own kingdom, no buildings similar to these are to be found, except in Scandinavia. On the mountain Swalberg in Norway is one; the Stir-biskop, at Upsal in Sweden, is another; and Umseborg, in the same kingdom, is a third.

These towers vary in their inner structure; but externally are universally the same; yet some have an addition of strength on the outside. The burgh of Culswick in Shetland, notwithstanding it is built on the top of a hill, is surrounded with a dry ditch 13 feet broad; that of Snaburgh in Unst, has both a wet and a dry ditch; the first cut, with great labour, through the live rock. The burgh of Moura is surrounded by a wall, now reduced to a heap of stones, and the inside is cylindrical, not taper, as usual with others. The burgh of Hogsøter, upon an isle in a loch of the same name, has also its addition of a wall; a peculiarity in a causeway, to join it to the main land, and a singular internal structure. Numbers of little burghs, with single cells, are scattered about these islands, in the neighbourhood of the greater; and which probably were built by the poorer sort of people, in order to enjoy their protection. A multitude of places in these islands have the addition of burgh to their names, notwithstanding there is not a vestige of a tower near them; the materials having long since been carried away, and applied to various uses.

DUNBAR, a parliament town of Scotland, in the shire of Mid-Lothian, once remarkable for a strong castle, the key of Scotland from the east, and which gave shelter to Edward II. of England in his flight from Bannockburn, but of which scarce a vestige now remains. Here are still preserved some of the Scottish pikes, six ells long, and formed for both offence and defence. This town has now a tolerable trade in the fisheries, and is remarkable for making good malt. Dunbar has given titles of honour to different families, who are all now extinct.

DUNBARTON, the chief town of Lenox or Dunbarton shire in Scotland, situated in W. Long. 4. 32. N. Lat. 56. 30. It is remarkable for nothing but its castle. This is a steep rock, rising up in two points, and every where inaccessible, except by a very narrow passage or entry, fortified with a strong wall or rampart. Within this wall is the guard-house, with lodgings for the officers; and from hence a long flight of stone-steps ascends to the upper part of the castle, where there are several batteries mounted with cannon, the wall being continued almost round the rock. In the middle of this upper part where the rock divides, there are commodious barracks with a deep well, in which there is always plenty of water. Here likewise are the remains of a gateway and prodigious high wall, at the top of which there was a wooden bridge of communication from one rock to another. This gateway was sometimes blocked up during the intestine commotions of Scotland, so that garrisons of different factions possessed different parts of the castle, and each had a gate towards the water. The castle stands in the angle formed at the conflux of the Clyde and Leven; so that it is wholly surrounded by water, except a narrow isthmus, and even this is overflowed at every spring-tide: nor is there any hill or eminence within a Scots mile of this fortress. It commands the navigation of the Clyde; and, being deemed the key of the western Highlands, is kept in some repair, and garrisoned with invalids, under the command of a governor and some subaltern officers. The government of it is worth 700l. a year.—Dunbarton is a royal borough; and formerly

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merly gave title of Earl to a branch of the family of Douglas.

DUNCANNON, a fort in the county of Wexford, and province of Leinster, in Ireland, seated on the river Rofs. It commands the river, inasmuch that no ship can pass to Waterford or Rofs without its permission. Here are barracks for three companies of foot. W. Long. 6. 30. N. Lat. 52. 10.

DUNCARDS, DUNKERS, or Tunkers. See **TUNKERS**.

DUNCOMBE (William), younger son of John Duncombe, Esq; of Stocks in Hertfordshire, in 1722 published a translation of Racine's *Athaliah*; which was well received by the public, and has gone through three editions. In 1724 he was editor of the works of Mr Needler; in 1735, of the poems of his deceased brother-in-law, Mr Hughes, 2 vols 12mo; in 1737, of the miscellanies of his younger brother Mr Jabez Hughes, for the benefit of his widow, in one volume 8vo; and in 1745, of the works of the Rev. Mr Samuel Say, in one volume 4to. In 1726 he married the only sister of John Hughes, Esq; whom he long survived. In 1734 his tragedy of *Lucius Junius Brutus* was acted at Drury-Lane Theatre. It was published in 1735, and again in 1747. The works of Horace, in English verse, by several hands, were published by him in two vols 8vo, with notes, &c. in 1757. A second edition, in four vols 12mo, with many imitations, was published in 1762. In 1763 he collected and republished "Seven sermons by archbishop Herring, on public occasions, with a biographical preface." He died Feb. 26. 1769, aged 80.

DUNDALK, a town of Ireland, in the county of Louth, about 40 miles from Dublin. It is a large, ancient, and thriving town, with a wide street, near a mile long, and a very fine market-house, near the entrance from Dublin. In the reign of Edward II. it was a royal city, and the last we read of where a monarch of all Ireland was actually crowned and resided. It was formerly very strong, and had many towers and small castles in it. It is very advantageously situated for a most extensive inland trade, and the port is very safe for shipping. The bay has good moorings at all times, in four to upwards of eight fathoms water, with very good land-marks, either for bringing up to, or making the harbour; and in crossing the bar at high water, or ordinary neap tides, there is from 15 to 18 feet water. The only cambric manufacture in Ireland is carried on in this town.

DUNDEE, a parliament town of Scotland, in the shire of Forfar or Angus, is seated on the north side of the river Tay, about 12 measured miles from its mouth, 40 measured miles north of Edinburgh, and 22 east from Perth, in W. Long. 2. 48. N. Lat. 56. 26. Its situation for commerce is very advantageous. Trading vessels of the largest burden can get into the harbour; and on the quay there are three very convenient and handsome warehouses built in 1756, as well as good room for shipbuilding, which is carried on to a large extent. The houses are built of stone, generally three and four stories high. The market-place or high street in the middle of the town is a very spacious oblong square, 360 feet long and 100 feet broad; from whence branch out the four principal streets, which with a number of lesser ones are all paved

in the best manner. On the south side of the market-place stands the town-house; an elegant structure, with a very handsome front, piazzas below, and a neat spire over it 140 feet high. This building was finished in the year 1734, and contains the guild-hall, the court-room, a very neat mason-lodge, the bank, vaulted repositories for the records, and the common prison, which is in the upper story, and does honour to the taste and humanity of the magistrates, under whose auspices it was constructed, being well aired commodious rooms, at the same time very strong and secure. Each prison is 20 feet by 12, and 7½ feet high, well arched above and below.

The meal-market and shambles, which were formerly on the high street, and esteemed a nuisance, were removed some years ago; and in the place of the shambles, there is now erected by the incorporated trades, on the east end of the above large square, a grand building, with a large and elegant cupola: in the ground-flat of which is a very neat coffee-room, and several merchant shops; and in the upper stories public rooms for each trade, and a common hall occasionally used as a theatre. This hall is 50 feet long, 30 feet broad, and 25 feet high; having its front to the square decorated with Ionic columns.

The opulence of the corporations, nine in number, may be inferred from this, that they had, along with the kirk-session, but very lately finished a most elegant church when they set about building the hall. This church, which is called *St Andrew's Church*, stands on a rising ground a little north from the Cowgate street; and has an elegant spire 130 feet high, with a peal of bells much admired. There is a neat entry to the church by a broad gravel walk, with grass plots on every side; and the whole policies around it are laid out with excellent taste, and in a superb stile, as complete and well executed as any in Scotland.

Dundee, beside St Andrew's church, has four other churches, and five ministers on the legal establishment. The old church, in which were originally four places of worship, when entire, had been a very magnificent building, with a large square Gothic tower or steeple 186 feet high, on the west end of the church. This building was in the form of a cross, erected by David Earl of Huntington, brother to William I. of Scotland (surnamed the Lion), and was dedicated to the Virgin Mary. This he did on his return from the third crusade (in which with 500 of his countrymen he had accompanied Richard I. of England) anno 1189, in gratitude for his deliverance from several imminent dangers, and particularly from shipwreck, by which he had nearly perished when in sight of this town. At the same time he changed the name of the town from *Allectum* to *Dei Donum*, whence its present name is thought by many to be derived; while others maintain that its name was *Duntay*, or "the Hill of Tay." The word *Allectum* in the Gaelic signifies "beautiful," and harmonizes very well with the scripture sense of the Hill of God. The word *Duntay* has the very same signification, "the Hill of God;" and both agree with the delightful situation of Dundee, and unite in giving it with propriety the name of *Bonny Dundee*. The hill rises on the north of the town to a great height, and is called *The Law of Dundee*; *law* being a Saxon word for a round hill such as it is. On its top.

Dundee.

Dundee. top there are evidently the remains of a camp, said to have been first erected by Edward I. of England, and lastly repaired by General Monk. Where the meal-market stood is now erected an elegant Episcopal meeting-house, with handsome shops below.

Dundee had an old castle which was demolished by the famous Scots governor Sir William Wallace, who was educated in this town. The castle had proved very useful to Edward I. when he put a garrison into it to awe the inhabitants; but Wallace getting possession, ordered it to be destroyed, lest it should again fall into the hands of the English. This treatment so exasperated Edward, that, taking the town by storm, he set fire to the churches; and a number of the inhabitants having taken sanctuary there with their most valuable effects, were all burnt along with them. At that time he burnt also a great part of the town. The desolation he brought on the church has continued ever since, till the year 1787, when a noble edifice began to be built on the site of the one that was burnt down, and is now finishing; in which the ancient Gothic of the outside is excellently united with internal modern architecture, making one of the largest and neatest churches in the kingdom, and again completing the superb superstructure as erected at the first by the Earl of Huntingdon.

This town suffered greatly last century during the troubles of Charles II. and the usurpation of Oliver Cromwell; being sometimes under the command of one party, and at others in the mercy of another. In 1645 the Marquis of Montrose took it by storm; and in 1651, under the command of its provost Major General Lumden, it vigorously opposed General Monk, who carried it by storm the first of September, and put all in arms to the sword. And so great were the riches of Dundee, all the neighbouring gentlemen having retired to it with their best effects as a place of safety, that every private soldier in General Monk's army had near 60 l. Sterling to his share of the plunder; there being above 60 merchant vessels in the harbour at that time, and the like number of vessels sailed for England loaded with the spoils of the unfortunate inhabitants. By these and other invasions, the whole ancient records of the town were destroyed, except a deed of Queen Mary, signed by herself, conferring the present burying ground; and some charters of the Charles's, confirming the ancient rights and privileges as disposed by the Alexanders and others kings of Scotland. This burying-ground is the only place in Scotland we know of called *The Hoff*, a Dutch word bearing all the senses of the English word *court*, having been formerly the burying-ground of one of the many religious houses that were in this town previous to the Reformation.

Dundee at present has 113 vessels belonging to the port, of above 8200 tons burden, and near 1000 seamen. Of these vessels four went last season to Greenland, a trade of long standing here. And beside the three public warehouses on the shore, there are above twenty large private warehouses belonging to the merchants. The magistrates have been lately and still are at great expence in enlarging and fitting up the harbour, so as to render it of easy access, safe, and commodious; and have now made the passage over the Tay, where there is a great resort, so convenient, that travellers

with their horses can get over at any time of tide, and a sufficient number of good boats properly manned are always ready. The river Tay opposite Dundee is about three miles broad; and being sheltered by high lands on both sides, is a safe road for ships of the greatest burden: the piers are extensive, broad, and well adapted for the purposes of loading and discharging vessels; and when the harbour is completed in the plan they are presently engaged in, there will not be one superior to it in Scotland.

To enable the town to repair the damage done by Cromwell's army, and also their harbour and other public works, Charles II. granted them a small impost of one-sixth of a penny Sterling, for 25 years, on the pint of ale brewed or brought into the town for sale; which grant has been frequently renewed by subsequent parliaments; and the fund arising therefrom is most properly bestowed by the magistrates in improving the town, and making it more convenient and healthy. For these purposes, several new streets have been made, the old ones have been widened, and a large convenient one at a considerable expence carried down from the market-place to join a fine walk, shaded very neatly with trees, that leads to the shore. This new street makes the access easy and commodious, which was formerly much confined and steep.

Till the year 1745, the town had only draw-wells; but since that period it is most amply supplied from a large fine fountain of excellent water, conveyed through the town in lead pipes, and discharged by good wells at proper distances. These, with a fine well in the town's meadows, and a stream of water that runs thro' the ward and the meadows (two large beautiful greens on the north of the town), make it as well watered as any town in Scotland; and these greens, just at hand, serve all the inhabitants most commodiously for the necessary labours of washing and bleaching.

The number of inhabitants in Dundee have increased above 4000 since 1780. There was then an accurate list of them taken, when they amounted to near 16,000; and lately they were reckoned and found within a few of 20,000; and since the year 1760 they are fully doubled. Beside the established churches, there are three Episcopal meeting-houses, two of Seceders, one of Methodists, two of Independents, one Berean, and two Anabaptists. One of the Independents is of the Glasite denomination. Mr John Glas, from whom they take that name, resided here; and his principles, though spread far and wide, have always had the greatest following in Dundee.

The trade in the town has increased amazingly of late. Its staple is undoubtedly the linen manufacture: for which in summer 1788 they imported from the Baltic 32 cargoes of flax, hemp, &c. near 3000 tons, beside several quantities from London, Leith, and other places; and on an average the brown linen stamped for the two preceding seasons at the stamp-office here amounted to about four millions of yards, in value about 115,000 l. Sterling. The flax is wrought up into coarse linens, chiefly Osna-burgs, sheetings, foldiers shirtings, &c. which is sold partly bleached (several fine large bleachfields being well employed in the neighbourhood) and partly brown. These linens are sent principally to London, Glasgow, and Liverpool, and from thence exported. Seven or

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eight vessels are constantly employed in the trade between Dundee and London, one of which sails every ten or twelve days. The making sail-cloth has been long established here, and is carried on to a good extent. Two rope-works have succeeded well, and a buckram-work has also been established for several years. The Dundee coloured threads have been long justly esteemed, and give bread to a great number of people; indeed it was here that coloured threads first made a figure among the articles of trade in Scotland. Their sugar-house, a large undertaking, and tan-works, are of established reputation. There has been lately erected a large glass-work at a great expence, and a plumbery and foundery are also now carried on to advantage. No doubt the trade of the place has been greatly promoted by the Bank; which is carried forward on the surest and most steady footing, and has always managed the business of the town and neighbourhood in such a way as to keep any other establishment of that kind from taking place. Of late the cotton manufactory has been introduced; a number of jennies being employed in spinning, and several looms in weaving it. A large machine for spinning shorts or backens into candlewicks, the first of the kind in Scotland, is also begun to work here, and promises to do well. A spirit for literature and education has greatly prevailed of late years in Dundee: for beside the public grammar-school, which has an able rector and two good masters; the public English and writing school, where are three very proper masters; there is also lately established, and much encouraged, an academy for mathematics, French, Italian, and the polite arts, with masters suitable for the different branches, and a large apparatus for natural philosophy.

The salmon fishing in Tay is of much consequence; and the town is generally well supplied with fish of various kinds, though like every other article of living much raised in price of late years. Their other markets are also well supplied. An excellent nursery at the west end of the town has been much encouraged; and its neighbourhood is now adorned with many neat and elegant villas, showing the wealth and taste of the inhabitants.

Dundee is the birth-place of the celebrated and learned Hector Boethius, whose History of Scotland has been long in much reputation with many. It, with Perth, Forfar, St Andrew's, and Cupar, returns one member to the British parliament.

DUNFERMLINE. See **DUMFERMLINE.**

DUNG, in husbandry. See **AGRICULTURE**, n° 20.

DUNG-Bird. See **UPUPA.**

DUNG Meers, in husbandry, places where soils and dungs are mixed and digested together. These consist of pits, prepared at the bottom with stone and clay, that they may hold water, or the moisture of the dung; and ought to be so situated, that the sinks and drips of the houses and barns may run into them. Into these pits they cast refuse, fodder, litter, dung, weeds, &c. where they lie and rot together, till the farmer have occasion for them.

DUNG Worms, a species of fly-worms, of a short and somewhat flat body, found in great plenty among cow-dung in the months of September and October.

DUNGANNON, the chief town of the county of

Tyrone, in the province of Ulster in Ireland. It is seated on a hill, and is a place of some strength.

DUNGARVON, a town of Ireland, in the county of Waterford. It stands on a bay of the same name, has a commodious harbour for ships, and is a walled town with a castle. W. Long. 7. 55. N. Lat. 51. 57.

DUNIPACE. See the article **CARRON.**

DUNKELD, a town of Scotland, in the shire of Perth, seated on the north side of the river Tay, in a situation truly romantic, under and among very high and almost inaccessible craggs, part naked and part wooded. It is the chief market town of the Highlands, and has been greatly improved with buildings by the Dukes of Athol.

The place is of great antiquity. It was the capital of ancient Caledonia. About the dawn of Christianity, a Pictish king made it the seat of religion, by erecting a monastery of Culdees there; which King David I. in 1130 converted into a cathedral, and it ranked as the first in Scotland. The entire shell of the cathedral still remains, the east end serving for a kirk, on the north side of which is the burial place of the Dukes of Athol. The style of architecture is simple and elegant, the pillars round. The monument of one of its bishops remains in the south aisle of the nave, as also that of Alexander Stuart Earl of Buchan, third son of Robert II. called for his cruelty *The Wolf of Badenoch*, who died 1394. The tower at the west end, with a singular crack down one of its sides, adds to the picturesque appearance which the whole makes among the venerable pines at the end of the Duke's garden. His Grace's seat is a modern building, and not large, with pleasant walks and policies, and a fine cascade on the water of Bran, which in its way from the western hills forms an astonishing fall of 150 feet, called the *Rumbling Brig*, from a narrow bridge made by the fall of two rocks across the stream. The pencil of Rosa never formed a more horrid scene. The stream has a second fall, which, without seeing the other, would be deemed capital. Sir James Galloway, master of requests to James VI. and Charles I. was created Lord Dunkeld 1645, whose grandson James was attainted at the Revolution, and dying at the beginning of this century, the title became extinct.

DUNKERS, **DUNCARDS**, or *Tunkers*. See **TUNKERS.**

DUNKIRK, a maritime town of the French Netherlands, situated in E. Long. 2. 28. N. Lat. 51. 10. and is the most easterly harbour on the side of France which is next to Great Britain.—It was originally a mean hamlet, consisting only of a few fishermen's huts; but a church being built there, it was from that, and from its situation, which is a sandy eminence, called *Dunkirk*; *dun* signifying, in the old Gallic language, a hill; and *kirk* being the old Flemish name for church.

About the year 960, Baldwin Earl of Flanders, thinking the situation convenient, enlarged it into a kind of town, and surrounded it with a wall. In the year 1322, Robert of Flanders, who held it as an appendage, built a castle for its defence; which was afterwards demolished by the revolvers of Flanders. Robert of Bar erected a fortification round it, the remains of which are visible on the side next the harbour. The emperor Charles V. who held it as part of Flanders, built

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Dunkirk. built another castle to defend the harbour; but this was also demolished soon afterwards. In 1558, the French, under Marshal de Thermes, took Dunkirk by storm, and almost ruined the place; the Spaniards recovered it again in about a fortnight, and put all the French to the sword.

During a peace procured for the Dunkirkers by Philip II. of Spain, they rebuilt their town with greater splendor than before, and the inhabitants for a long time subsisted by privateers fitted out against the Dutch; and at length, growing rich by these hostilities, they fortified their town and harbour, and fitted out no less than 15 ships of war at their own charge.

In 1634, the Dunkirkers agreed with the inhabitants of Bergues to dig a canal, at their joint expence, for a communication between the two towns; which was some time afterwards effected. By this time, Dunkirk was become the best harbour the Spaniards possessed in Flanders, which induced many foreigners to settle there; and it being necessary to enlarge the town for their accommodation, a new fortified wall was built at a considerable distance from the former. In 1646, it was besieged and taken by the prince of Condé. In 1652 it was retaken by the archduke Leopold, then governor of the Netherlands. France entering into a treaty with England in 1655, the Dunkirkers, with views of pecuniary advantage, fitted out privateers against both those powers: the consequence of which was, that the French, assisted by Cromwell, attacked and took it; and it was put into the hands of the English, in consequence of a treaty between them and the French. To the English it was even then of very great importance; for, during the war in which it was taken, the Dunkirkers had made prizes of no less than 250 of their ships, many of which were of great value. They therefore improved the fortifications, and built a citadel: yet they kept it only four years; for in 1662, two years after the restoration, Charles II. sold this valuable acquisition to France, for the paltry sum of 500,000*l.* In consequence of this sale, the town was taken possession of for the French king Louis XIV. by the count d'Eftrades, on the 29th of November 1662. Louis having acquainted the celebrated engineer Monsieur Vauban, that he intended to make Dunkirk one of the strongest places in Europe, Vauban drew up a plan with that view, which was gradually executed. An arsenal was erected, large enough to contain all the stores necessary for fitting out and maintaining a large fleet of men of war; the fortifications on the land-side were constructed in a manner that was thought to render them impregnable; and towards the sea, the entrance of the harbour being properly formed, it was fortified by the jetties, and the two forts called *Green Fort* and the *Fort of Good Hope* at their extremities; the famous Risbank was also erected on one side of the jetties, and Fort Galliard on the other, to secure the town. These works were all completed in 1683; and in 1685, the whole circumference of the bason was faced with masonry, and the keys completely formed: at the same time care was taken to build at the entrance of this bason a sluice, almost 45 feet wide, that the ships within might be constantly afloat. In 1689, the fort called the *Cornichon*, and some other works, were completed. But though 30 years had been now employed in improving the fortifications of Dunkirk, it was not yet in the state

in which Louis intended to put it; and therefore, in **Dunkirk.** 1701, he caused a new risbank to be built, called *Fort Blanc*.

At the treaty of Utrecht, it having been made appear, that the privateers of Dunkirk had, during the war then closing, taken from the English no less than 1614 prizes, valued at 1,334,375*l.* Sterling, it was stipulated, that the fortifications of the city and port of Dunkirk should be entirely demolished, and the harbour filled up, so as never to be an harbour again.

The treaty, of which this demolition of Dunkirk was an article, was signed on the 28th of April 1713; but the demolition did not take place till the September following, when the queen deputed colonel Armstrong and colonel Clayton to oversee the execution of the treaty as far as concerned the works and harbour of Dunkirk.

Under the inspection of these gentlemen, the places of arms were broken down, the ditches filled up, and the demi-lunes, bastions, and covered way, totally destroyed; the citadel was razed, and the harbour and bason filled up; the jetties were also levelled with the strand, and all the forts which defended the entrance into the harbour were demolished. A large dam, or bar, was also built across the mouth of the harbour between the jetties and the town, by which all communication between the harbour and the canal, which formed its entrance, was entirely cut off. The sluices were also broken up, and the materials of them broken to pieces.

But this was no sooner done, than Louis XIV. ordered 30,000 men to work incessantly upon a new canal, the canal of Mardick, which in a short time they accomplished; by which the harbour was rendered almost as commodious as ever: but in 1717 this likewise was rendered unserviceable.

In the year 1720, during a great storm, the sea broke up the bar or dam, and restored to the Dunkirkers the use of the harbour in a very considerable degree.

In the year 1740, when Great Britain was engaged in a war with Spain, Louis XV. set out about improving the advantage which Dunkirk had derived from the storm in 1720, by restoring the works, and repairing the harbour. He rebuilt the jetties and erected new forts in the place of those which had been destroyed; and soon afterwards he espoused the cause of Spain, and became a principal in the war against us.

But at the peace of Aix-la-Chapelle in 1748, it was stipulated, that all the works towards the sea should be destroyed a second time; yet, before the declaration of the last war, the place was in as good a state of defence towards the sea as it was at any time during the war which was concluded by the treaty of Aix-la-Chapelle.

DUNSE, a market-town of Scotland, in the shire of Mers, situated in W. Long. 2. 15. N. Lat. 55. 42. It is seated on a rising ground in the middle of the shire, and has a weekly market for cattle. It is by some reputed the birth-place of the famous John Duns Scotus.—A mile south of the town is a well of mineral water, of great use as a deobstruent and antiscorbutic, first discovered in 1747 by Dr Thomas Simpson who practised there.

Duns.

DUNS scorius (John), a Franciscan friar, commonly called *Doctor Subtilis*, was born in the year 1274; but whether in England, Scotland, or Ireland, hath long been a matter of dispute among the learned of each nation. Dempster, Mackenzie, and other Scottish writers, assert positively that he was born at Dunse, a town in Scotland, about 15 miles from Berwick; and, to secure him more effectually, Mackenzie makes him descended from the Dunses in the Mers. MacCaghwell, an Irish author, who wrote the life of this Scotus, proves him to have been born at Down in the province of Ulster in Ireland: but Leland, Bale, Camden, and Pits, assure us, that he was born at Dunstone in the parish of Emildune, near Alnwick in Northumberland; and this opinion is rendered probable by the following conclusion of his manuscript works in the library of Merton college in Oxford.—“Here end the writings of that subtle doctor of the university of Paris, John Duns, who was born in a certain village, in the parish of Emildune, called *Dunston*, in the county of Northumberland.” We are told, that, when a boy, he became accidentally known to two Franciscan friars; who, finding him to be a youth of very extraordinary capacity, took him to their convent at Newcastle, and afterwards persuaded him to become one of their fraternity. From thence he was sent to Oxford, where he was made fellow of Merton college and professor of divinity; and Mackenzie says, that not less than 30,000 students came to Oxford to hear his lectures. His fame was now become so universal, that the general of his order commanded him to go to Paris, that the students of that university might also profit from his lectures. He went to Paris in the year 1304, where he was honoured first with the degree of bachelor, then of doctor of divinity, and in 1307 was appointed regent of the divinity schools: during his residence here, the famous controversy about the *Immaculate conception of the virgin Mary* arose. Albertus Magnus maintained that she was born in original sin. Scotus advanced 200 arguments in support of the contrary opinion, and convinced the university of Paris that she was really conceived immaculate. This important nonsense, however, continued to be disputed till the year 1496, after the council of Basil, when the university of Paris made a decree, that no student, who did not believe the *immaculate conception*, should be admitted to a degree. Our author had not been above a year at Paris, when the same general of the Franciscans ordered him to remove to Cologne; where he was received with great pomp and ceremony by the magistrates and nobles of that city, and where he died of an apoplexy soon after his arrival, in the year 1308, in the 34th year of his age. Some writers have reported, that Scotus was buried in an epileptic fit; and that, upon removing his bones, he appeared to have turned himself in his coffin. This *doctor subtilis* was doubtless one of the first wranglers of his time, admirably well versed in scholastic divinity, and a most indefatigable scribbler; but the misfortune is, that all his huge volumes do not contain a single page worth the perusal of a rational being. He was the author of a new sect of schoolmen called *Scotists*; who opposed the opinions of the Thomists, so called from St Thomas Aquinas. The reader will find a more particular ac-

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count of Scotus in the Franciscan Martyrology, published at Paris in 1638.—He was a most voluminous writer; his works making 12 vols. folio, as published at Lyons by Luke Wadding, 1639.

DUNSTABLE, a town in Bedfordshire, with a market on Wednesdays. It is seated on a chalky hill; and has ponds in the streets, which are never dry tho' only supplied with rain water. It is remarkable for several good inns, it being a great thoroughfare on the northern road. It consists of four streets, intersecting each other at right angles; and in the centre stood one of those beautiful crosses of queen Eleanor, which was destroyed by the enthusiasts in the time of the civil wars. W. Long. o. 29. N. Lat. 51. 50.

DUNSTAFFNAGE. See LORNE.

DUNSTAN, a famous saint, and archbishop of Canterbury; of whom the monkish historians give us the following account. He was descended from a noble family in Wessex, and educated in the abbey of Glastonbury. Here he studied so hard, that it threw him into a violent fever which brought him to the very point of death. When the whole family were standing about his bed, dissolved in tears, and expecting every moment to see him expire, an angel came from heaven in a dreadful storm, and gave him a medicine which restored him to perfect health in a moment. Dunstan immediately started from his bed, and run with all his speed towards the church to return thanks for his recovery; but the devil met him by the way, surrounded by a great multitude of black dogs, and endeavoured to obstruct his passage. This would have frightened some boys; but it had no such effect upon Dunstan; who pronouncing a sacred name, and brandishing his stick, put the devil and all his dogs to flight. The church-doors being shut, an angel took him in his arms, conveyed him through an opening in the roof, and set him softly down on the floor, where he performed his devotions. After his recovery, he pursued his studies with the greatest ardor, and soon became a perfect master in philosophy, divinity, music, painting, writing, sculpture, working in gold, silver, brass, and iron, &c. When he was still very young he entered into holy orders, and was introduced by his uncle Athelm archbishop of Canterbury to King Athelstan; who, charmed with his person and accomplishments, retained him in his court, and employed him in many great affairs. At leisure hours he used to entertain the king and his courtiers with playing on his harp, or some other musical instrument; and now and then he wrought a miracle, which gained him great admiration. His old enemy the devil was much offended at this, and prompted some envious courtiers to persuade the king that his favourite was a magician, which that prince too readily believed. Dunstan discovering by the king's countenance that he had lost his favour, and resolving to resign rather than be turned out, retired from court to another uncle, who was bishop of Winchester. This good prelate prevailed upon his nephew to forsake the world and become a monk; after which he retired to a little cell built against the church-wall of Glastonbury. Here he slept, studied, prayed, meditated, and sometimes amused himself with forging several useful things in brass and iron. One evening, as he was working very busily at his

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forge,

Dunstable
Dunstan.

Dunstan. forge, the devil, putting on the appearance of a man, thrust his head in at the window of his cell, and asked him to make something or other for him. Dunstan was so intent upon his work that he made no answer; on which the devil began to swear and talk obscenely, which betrayed the lurking fiend. The holy blacksmith, putting up a secret ejaculation, pulled his tongs, which were red-hot, out of the fire, seized the devil with them by the nose, and squeezed him with all his strength; which made his infernal majesty roar and scold at such a rate, that he awakened and terrified all the people for many miles around. Thus far the legend.

Ridiculous as were these fictions, they served, in those times of ignorance, to procure Dunstan a reputation which has been confirmed by the authority of several succeeding historians. It appears that this extraordinary person was recalled to court by king Edmund, A. D. 941; who bestowed upon him the rich abbey of Glastonbury, which for his sake he honoured with many peculiar privileges. He enjoyed a very high degree of the favour of this prince during his short reign of six years; but he stood much higher in the favour of his brother and successor king Edred, to whom he was confessor, chief confidant, and prime minister. He employed all his influence during this period of court-favour in promoting the interest of the monks of the Benedictine order, to which he belonged, and of which he was a most active and zealous patron. Having the treasures of these two princes, especially of the last, very much at his command, he lavished them away in building and endowing monasteries for these monks, because almost all the old monasteries were in the possession of secular canons. Not contented with this, he persuaded Edred (who was a bigotted valetudinary) to bestow such immense treasures on the churches and monasteries by his last will, that the crown was stripped of its most valuable possessions, and left in a state of indigence. This conduct of Dunstan, while he was in power, rendered him very odious to Edwi, who succeeded his uncle Edred A. D. 955; and his rude behaviour to himself, and his beloved queen Elgiva, raised the resentment of that prince so high, that he deprived him of all his preferments, and drove him into exile*. The banishment of Dunstan, the great patron, or (as Malmesbury calls him) the prince of monks, was a severe blow to that order, who were expelled from several monasteries; which were made the impure stables (according to the same author) of the married clergy. But their sufferings were not of long continuance. For Edgar, the younger brother of Edwi, having raised a successful rebellion against his unhappy brother, and usurped all his dominions on the north side of the river Thames, recalled Dunstan, and gave him the bishopric of Worcester, A. D. 957. From this moment he was the chief confidant and prime minister of king Edgar, who became sole monarch of England A. D. 959, by the death of his elder brother Edwi. In the following year Dunstan was raised to be archbishop of Canterbury; and being thus possessed of the primacy, and assured of the royal support and assistance, he prepared to execute the grand design which he had long meditated, of compelling the secular canons to put away their wives and become monks; or of driving them

out and introducing Benedictine monks in their room. With this view he procured the promotion of Oswald to the see of Worcester, and of Ethelwald to that of Winchester; two prelates who were monks themselves, and animated with the most ardent zeal for the advancement of their order. And these three great champions of the order found means, by their arts and intrigues, in the course of a few years, to fill no fewer than 48 monasteries with Benedictines. But on the death of Edgar in 975 they received a check. The sufferings of the persecuted canons had excited much compassion; and many of the nobility, who had been overawed by the power and zeal of the late king, now espoused their cause and promoted their restoration. Elferc Duke of Mercia drove the monks by force out of all the monasteries in that extensive province, and brought back the canons, with their wives and children; while Elfwin Duke of East Anglia, and Brithnot Duke of Essex, raised their troops to protect the monks in these countries. To allay these commotions, several councils were held: in which Dunstan was so hard pushed by the secular canons and their friends, that he was obliged to practise some of his holy stratagems; and finally, by dint of miracles, overcame all opposition*.

St Dunstan died A. D. 988, in the 64th year of his age, having held the bishopric of London, together with the archbishopric of Canterbury, about 27 years. As this prelate was the great restorer and promoter of the monastic institutions, the grateful monks, who were almost the only historians of those dark ages, have loaded him with the most extravagant praises, and represented him as the greatest wonder-worker and highest favourite of heaven that ever lived. To say nothing of his many conflicts with the devil, in which he often belaboured that enemy of mankind most severely, the following short story, which is told with great exultation by his biographer Osbern, will give the reader some idea of the astonishing impiety and impudence of those monks, and of the no less astonishing blindness and credulity of those unhappy times. "The most admirable, the most inestimable Father Dunstan (says that author), whose perfections exceeded all human imagination, was admitted to behold the mother of God and his own mother in eternal glory: for before his death he was carried up into heaven, to be present at the nuptials of his own mother with the Eternal King, which were celebrated by the angels with the most sweet and joyous songs. When the angels reproached him for his silence on this great occasion, so honourable to his mother, he excused himself on account of his being unacquainted with those sweet and heavenly strains; but being a little instructed by the angels, he broke out into this melodious song, O King and Ruler of nations," &c. It is unnecessary to make any comment on this most shocking story.

The violent and too successful zeal of Dunstan and his associates, in promoting the building and endowing so great a number of houses for the entertainment of useless monks and nuns, was very fatal to their country: for by this means a spirit of irrational unmanly superstition was diffused amongst the people, which debased their minds and diverted them from nobler pursuits; and a very great proportion of the lands of England being put into hands who contributed nothing.

* See Eng-
land, n^o 57.

* See Eng-
land, n^o 64.

Dunum thing to its defence, rendered it an easy prey, first to the insulting Danes, and afterwards to the victorious Normans.

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Duplica-
ture.

DUNUM, a Celtic term, denoting a hill or eminence, and which often concurs to form the names of towns, to signify their high situation, places of strength or citadels, hills or eminences, being adapted to such structures. See **DUN**.

DUNUM (Ptolemy), a town of Ireland; now thought to be *Down* or *Down-Patrick*, in the county of Down. W. Long. 5. 57. N. Lat. 54. 23.

DUO, in music, a song or composition, to be performed on two parts only, one sung, the other played on an instrument, or by two voices.

Duo is also when two voices sing different parts, as accompanied with a third, which is a thorough bass. It is seldom that unisons and octaves are used in duos, except at the beginning and end.

DUODECIMA, in music, is the twelfth or the fifth doubled.

DUODENUM. See **ANATOMY**, p. 727.

DUPIN (Lewis Ellis), a learned doctor of the Sorbonne, and one of the greatest critics of his time, especially in ecclesiastical matters, was born at Paris in 1657. When he published the first volume of his *Bibliothèque Universelle des Auteurs Ecclesiastiques*, in 1686, the liberty with which he treated some ecclesiastical writers, gave such offence, that M. de Harlay, archbishop of Paris, obliged Dupin to retract many propositions, and suppressed the work. He was nevertheless suffered to continue it, by altering the title from *Bibliothèque Universelle*, to *Bibliothèque Nouvelle*. This great undertaking continued in several successive volumes, though sufficient to occupy the life of an ordinary man, did not hinder M. Dupin from obliging the world with several other works. He was a man of prodigious reading; and had an easy happy way of writing, with an uncommon talent at analysing the works of an author; which makes his Ecclesiastical Bibliothèque so valuable. M. Dupin was professor of philosophy in the royal college; but was banished some time from the chair to Chatelleraut, on account of the famous *Cas de Conscience*; but was restored, and died in 1719.

DUPLE, among mathematicians, denotes the ratio of 2 to 1. Thus the ratio of 8 to 4 is duple, or as 2 to 1.

Sub-Duple Ratio, is just the reverse of the former, or as 1 to 2. Such is 4 to 8, or 6 to 12.

DUPLICATE, among lawyers, denotes a copy of any deed, writing, or account. It is also used for the second letters-patent, granted by the lord chancellor in a case wherein he had before done the same. Also a second letter written and sent to the same party and purpose as a former, for fear of the first's miscarrying, is called a *duplicate*.

Duplicate Proportion or *Ratio*. See **RATIO**.

DUPLICATION, in general, signifies the doubling of any thing, or multiplying of it by 2: also the folding of any thing back again on itself.

DUPLICATURE, among anatomists, a term used to denote the folds of any membrane or vessel: thus we say, the *duplicatures of the intestines, peritonæum, &c.*

DUPONDIUS, in antiquity, a weight of two pounds, or a money of the value of two asses. See **AS**. As the as at first weighed a just pondo or libra, the dupondius then weighed two; and hence the name.

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Durer.

And though the weight of the as was afterwards diminished, and of consequence that of the dupondius also, yet they still retained the denomination. See **POUND** and **LIBRA**.

DUPPA (Brian), a learned English bishop born in 1589 at Lewisham in Kent, of which place his father was then vicar. In 1634, he was instituted chancellor of the church at Sarum, and soon after made chaplain to Charles I. He was appointed tutor to Charles prince of Wales, and his brother James duke of York; was made bishop of Chichester; and in 1641 translated to Salisbury, though the confusions that followed deprived him of all benefit from his promotion. Charles I. held him in high esteem, and he is said to have assisted the king in composing the *Eikon Basilike*. On the Restoration he was made bishop of Winchester, and lord high almoner; but died in 1662. He bequeathed large sums to charitable purposes: and published a few sermons, with other religious pieces.

DURANDUS (William), born at Puimoisson in Provence, in the 13th century, was one of the most knowing lawyers of his time. Pope Martin made him one of his nuncios, and then bishop of Mende and Languedoc. His *Speculum Juris* gave him the name of *Speculator*; his second piece was *Rationale divinorum officiorum*, containing eight books. He wrote several others.

DURANTA, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 40th order, *Personate*. The calyx is quinquefid, superior; the berry tetraspermous; the seeds bilocular.

DURATION, an idea we get by attending to the fleeting and perpetual perishing parts of succession. See **METAPHYSICS**.

DURATION, as marked by certain periods and measures, is what we most properly call *time*. See **TIME**.

DURATION of Action, according to Aristotle, is confined to a natural day in tragedy; but the epopea, according to the same critic, has no fixed time. See **POETRY**.

DURER (Albert), descended of an Hungarian family, and born at Nuremberg in 1471, was one of the best engravers and painters of his age. He was at the same time a man of letters and a philosopher; and he was an intimate friend of Erasmus, who revised some of the pieces which he published. He was a man of business also, and for many years the leading magistrate of Nuremberg. Though not the inventor, he was one of the first improvers of the art of engraving; and he bethought himself of working also in wood, for expedition, having an inexhaustible fund of designs. In many of those prints which he executed on copper, the engraving is elegant to a great degree. His *Hell Scene* particularly, which was engraved in the year 1513, is as highly finished a print as ever was engraved, and as happily executed. In his wooden prints too we are surprised to see so much meaning in so early a master; the heads so well marked, and every part so well executed.

Dureffe
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Durham.

cuted.—This artist seems to have understood the principles of design. His composition, too, is often pleasing; and his drawing generally good. But he knows very little of the management of light; and still less of grace: and yet his ideas are purer and more elegant than we could have supposed from the awkward archetypes which his country and education afforded. In a word, he was certainly a man of a very extensive genius; and, as Vafari remarks, would have been an extraordinary artist, if he had had an Italian instead of a German education. His prints are very numerous. They were much admired in his own life-time, and eagerly bought up; which put his wife, who was a teasing woman, upon urging him to spend more time upon engraving than he was inclined to do. He was rich; and chose rather to practise his art as an amusement than as a business. He died in the year 1527.

DURESSE, **HARDSHIP**, in law, is where a person is kept in prison or restrained of his liberty, contrary to order of law; or is threatened to be killed, maimed, or beaten. In which case, if a person so in prison, or in fear of such threats, make any specialty or obligation, by reason of such imprisonment or threats, such deed is void in law; and in an action brought on such specialty, the party may plead, that it was brought by dureffe.

D'URFEY (Thomas), an eminent English satyrist and songster, whose name, though as well known as that of any writer extant, yet there are very few particulars of his life to be collected. He was born in Devonshire; but when, where, or of what family, are all uncertain. He was bred to the law, which he forsook for the more agreeable employment of writing plays and songs; and the latter he had so happy a talent both of writing and singing, that he received many favours from persons of quality on that account. Even crowned heads did not disdain his company. The writer of the *Guardian*, N^o 67. tells us, he remembered to have seen Charles II. leaning on Tom D'Urfe's shoulder more than once, humming over a song with him. This indeed was not extraordinary in so merry a monarch; but even the phlegmatic king William could relax his muscles on hearing him sing. He was certainly by all accounts a cheerful, honest, good-natured man: but as this character does not include prudence, D'Urfe grew poor as he grew old; and prevailing on the managers of the playhouse to act his comedy of the *Plotting Sisters* for his benefit, Mr Addison wrote the abovementioned paper in the *Guardian*, with another, N^o 82. representing him in a good humoured light, to procure him a full house. He died very old, in 1723.

DURHAM (bishopric of), one of the counties of England. Before the arrival of the Romans it was included in the British principality of the Brigantes, and after their arrival made part of the province of *Maxima Cæsariensis*. During the Heptarchy it made part of the kingdom of Northumberland, the 5th established, which began in 547, and ended in 827, having been governed by 31 kings. It was not mentioned by Alfred in his division of counties, being at that time considered as a part of Yorkshire. At present it is included in the northern circuit, in the province of York; and is a diocese and principality under the go-

vernment of its own bishop, being a county palatine, the second in rank, and the richest in England. It is bounded on the north by Northumberland, on the south by Yorkshire, on the east by the North Sea, and on the west by Cumberland. It is 39 miles long, 35 broad, and 107 in circumference; containing 410,000 square acres, or 758 square miles; with 97,000 inhabitants, 80 parishes, 21 vicarages, one city (Durham), and 9 market-towns, viz. Stockton, Sunderland, Barnard-Castle, Darlington, Stanhope, Hartlepool, Aukland, Staindrop, and Marwood; besides 223 villages. It is divided into 4 wards, sends 4 members to parliament, pays three portions of the land-tax, and provides 400 of the national militia. It has 21 parks, 4 castles, and 20 bridges, with the rivers Tees, Tine, Were, Tame, Lune, Darwent, Gauntless, Skern, &c. The Lune and Teesdale forests. Its principal products are lead, coals, iron, corn, mustard, salt, glass, fine ale, with excellent butter and salmon. The soil is various; the south is rich, but the western parts rocky and moorish.

Durham, as already observed, is a county palatine, governed by the bishop, who had formerly great prerogatives. He had power to create barons, appoint judges, convoke parliaments, raise taxes, and coin money. The courts of justice were kept in his name; and he granted pardons for trespasses, alienations, rapes, murders, and felonies of every denomination. He erected corporations, granted markets and fairs, created officers by patent, was lord admiral of the seas and waters within the county palatine: great part of the lands were held of the see *in capite*. In a word, he exercised all the power and jurisdiction of a sovereign prince. How and at what period these prerogatives were obtained, it is not easy to determine. Malmesbury says, the lands were granted by king Alfred, who likewise made the church a sanctuary for criminals. This see was anciently called the *patrimony of St Cuthbert*, who had been bishop of Landisfarne or Holy Island near Berwick. His bones being transferred to Durham, were long esteemed as precious relics; and the people of the county considered themselves as Halwerk men, exempted from all other but holy work, that is, the defence of St Cuthbert's body. Certain it is, they pretended to hold their lands by this tenure; and refused to serve out of the county either for the king or bishop: but king Edward I. broke through these privileges, and curtailed the prerogatives of the bishops, which were still further abridged by Henry VIII. Nevertheless, the bishop is still earl of Sadberg, a place in this county which he holds by barony. He is sheriff paramount, and appoints his own deputy, who makes up his audit to him, instead of accounting to the exchequer. He has all the forfeitures upon outlawries: and he and his temporal chancellor act as justices of the peace for the county palatine, which comprehends Creke in Yorkshire, Bedlington, Northam, and Holy Island, in Northumberland, the inhabitants of these places having the benefit of the courts at Durham. The judges of assize, and all the officers of the court, have still their ancient salaries from the bishop; and he constitutes the standing officers by his letters patent. He has the power of presiding in person in any of the courts of judicature. Even when judgment of blood

Durham. is given, this prelate may sit in court in his purple robes, though the canons forbid any clergyman to be present in such cases: hence the old saying, *Solum Dunelmense stola jus dicet et ense*. It was not till the reign of Charles II. that the bishopric sent representatives to parliament.

DURHAM, the capital of the above mentioned county, is situated in W. Long. 1. 14. N. Lat. 54. 50. It stands on a hill almost surrounded by the river Were; and is considerable for its extent and the number of its inhabitants, as well as for being the see and seat of the bishop, who is lord paramount. It stands about 280 miles north from London; being remarkable for the salubrity of its air, and the abundance and cheapness of its provisions. These circumstances have induced a great deal of good company to take up their residence at Durham, which is still further animated by the presence and court of the bishop and his clergy. The town is said to have been built about 70 years before the Norman conquest, on occasion of bringing hither the body of St Cuthbert. It was first incorporated by king Richard I. but queen Elizabeth extended its privileges. At length, in the year 1684, it obtained a charter; in consequence of which, it is now governed by a mayor, 12 aldermen, 12 common council men, with a recorder, and inferior officers. These can hold a court-leet and court-baron within the city; but under the style of the bishop, who as count palatine appoints a judge, steward, sheriffs, and other inferior magistrates. The mayor and aldermen also keep a *pie pouldres* court at their fairs, and pay a yearly toll to the bishop. They have a weekly market on Saturday, and three annual fairs. Durham is about a mile in length, and as much in breadth, resembling the figure of a crab, the market-place exhibiting the body, and the claws being represented by the streets, which bend according to the course of the river, that almost surrounds one part of the city. They are, moreover, dark and narrow; and some of them lying on the acclivity of a steep hill, are very difficult and dangerous to wheel-carriages. The houses are in general strong built, but neither light nor elegant. The most remarkable edifices are the cathedral with six other churches, three standing in the city, and as many in the suburbs; the college; the castle, or bishop's palace; the tolbooth near St Nicholas's church; the cross and conduit in the market-place; with two bridges over the Elvet. The cathedral was begun by bishop Carlepho in the 11th century. It is a large, magnificent, Gothic structure, 411 feet long, and 80 in breadth, having a cross aisle in the middle 170 feet in length, and two smaller aisles at each end. On the south-side is a fine cloister; on the east, the old library, the chapter-house, and part of the deanery; on the west, the dormitory, under which is the treasury and a chantry; and on the west side is the new library, an elegant building begun by dean Sudbury about 70 years ago, on the spot where stood the old refectory of the convent. The middle tower of the cathedral is 212 feet high. The whole building is arched and supported by huge pillars. Several of the windows are curiously painted; and there is a handsome screen at the entrance into the choir. Sixteen bishops are interred in the chapter-house, which is 75 feet long and 33 broad, arched over-head, with a magnificent seat at the upper end for the instalment of

the bishops. The consistory is kept in the chapel or west aisle called *Galilee*, which was built by bishop Pudsey, and had formerly 16 altars for women, as they were not allowed to advance farther than the line of marble by the side of the font; here likewise are deposited the bones of the venerable Bede, whose elogium is written on an old parchment scroll that hangs over his tomb. The long cross aisle, at the extremity of the church, was formerly distinguished by nine altars, four to the north, and four to the south, and the most magnificent in the middle dedicated to the patron St Cuthbert, whose rich shrine was in this quarter, formerly much frequented by pilgrims. The church is possessed of some old records relating to the affairs of Scotland, the kings of which were great benefactors to this cathedral. The ornaments here used for administering the divine offices, are said to be richer than those of any other cathedral in England. Before the reformation, it was distinguished by the name *Ecclesia sanctæ Mariæ et sancti Cuthberti*; but it obtained the appellation of *Ecclesia cathedralis Christi et beatæ Mariæ*, in the reign of Henry VIII. who endowed the deanery with 12 prebendaries, 12 minor canons, a deacon, sub-deacon, 16 lay singing men, a schoolmaster and usher, a master of the choir, a divinity reader, eight alms-men, 18 scholars, 10 choiristers, two vergers, two porters, two cooks, two butlers, and two sacristans. On the south-side of the cathedral is the college; a spacious court formed by the houses of the prebendaries, who are richly endowed and extremely well lodged. Above the college-gate, at the east end, is the exchequer; and at the west, a large hall for entertaining strangers, with the granary and other offices of the convent. The college-school, with the master's house, stands on the north side of the cathedral. Between the churchyard and castle, is an open area called the *palace green*; at the west end of which stands the shire-hall, where the assizes and sessions are held for the county. Hard by is the library built by bishop Cosin; together with the exchequer raised by bishop Nevil, in which are kept the offices belonging to the county-palatine court. There is an hospital on the east, endowed by bishop Cosin, and at each end of it are two schools founded by bishop Langley. On the north, is the castle built by William the Conqueror, and afterwards converted into the bishop's palace, the outward gate of which is at present the county-goal.

The city consists of three manors; the bishop's manor, containing the city liberties and the bailey, held of him by the service of castle-guard; the manor of the dean and chapter, consisting of the Elvet's cross gate, south-gate street; and the manor of Gilligate, formerly belonging to the dissolved hospital of Kepyar in this neighbourhood, but granted by Edward VI. to John Cockburn, lord of Ormiston, and late in the possession of John Tempest, Esq.

The bishopric of Durham is deemed the richest bishopric in the kingdom; and the prebends are frequently styled the Golden Prebends of Durham. The diocese contains the whole counties of Durham and Northumberland, except the jurisdiction of Hexham in the latter. It hath also one parish in the county of Cumberland: making in the whole 135 parishes, whereof 87 are impropriate. The see is valued in the king's books at L. 2821 : 1 : 5 $\frac{1}{4}$, but is computed to

Durham.

Durio he worth annually L. 8700. The clergy's tenths amount to L. 385 : 5 : 6½. It has two archdeacons, viz. of Durham and Northumberland. This see hath given to the church of Rome eight saints and one cardinal; and to the English nation one lord chief justice, five lord chancellors, three lord treasurers, one principal secretary of state, one chancellor to the university of Oxford, and two masters of the rolls.

In the neighbourhood of this city is Nevil's cross, famous for the battle fought in the year 1346, against David II. king of Scotland, who was defeated and taken.

DURIO, in botany: A genus of the polyandria order, belonging to the polyadelphia class of plants. The calyx is a monophyllous perianthium; the corolla has five petals growing to the calyx; the stamina are conjoined in five bodies; the germ is roundish; the style bristly, the length of the stamina. The fruit is a roundish apple every where mucicated; the seeds have a mucous orilla.

DURNIUM, or **DURNOVARIA**, a town of the Durotriges in Britain. Now *Dorchester*, the capital of Dorsetshire, on the Frome.

DUROBRIVÆ (anc. geog.), a town of the Caty-euchlani in Britain. Now in ruins, which lie on the Nen, between Caster and Dornford, in Northamptonshire, on the borders of Huntingdon.

DUROBRIVÆ, or *Durocobrivæ*, a town of the Trinobantes, in Britain; whose ruins are situated between Flamstead and Redburn, in Hertfordshire.

DUROBRIVIS, 25 miles to the west of Durovernum, or Canterbury; from which it appears to be Rochester town, confirmed by the charter of foundation of the church, in which it is called *Durobrevis*.

DUROCASSES, **DUROCASSIUM**, **DUROCASSÆ**, and **DUROCASSES**, a town of the Carnutes, in Gallia Celtica; now Dreux. See **DRUIDÆ**.

DUROCORNOVIUM (anc. geog.), a town of Britain; now *Cirencester*, in Gloucestershire (Camden). Called *Corinium* by Ptolemy.

DUROCORTORUM, or **DURICORTORA**, a town of the Rhemi in Belgica; now *Rheims* in Champaign. E. Long. 4. N. Lat. 49. 20.

DUROIA, in botany: A genus of the monogynia order, belonging to the hexandria class of plants. The calyx above is cylindrical and loped; the border six-parted; there are no filaments; the fruit a hispid apple.

DUROLENUM, a town of the Cantii in Britain; now *Lenham*, in Kent (Camden); *Charing* (Talbot).

DUROLITUM, a town of the Trinobantes; now *Leiton*, on the Ley, in Essex (Camden).

DUROTRIGES, an ancient British nation, seated in that part of the country which is now called *Dorsetshire*. Their name is derived from the two British words *Dur* "water," and *Trigo* "to dwell;" and it is no less evident that they got their name from the situation of their country, which lies along the sea-coast. It is not very certain whether the Durotriges formed an independent state under a prince of their own, or were united with their neighbours the Danmonii; as they were reduced by Vespasian under the dominion of the Romans, at the same time, and with the same ease, and never revolted. The peaceable disposition of the inhabitants was probably the reason that the Ro-

mans had so few towns, forts, and garrisons, in this pleasant country. *Dorchester*, its present capital, seems to have been a Roman city of some consideration, though our antiquaries are not agreed about its Roman name. It is most probable that it was the *Durno-varia* in the 12th Iter of Antoninus. Many Roman coins have been found at *Dorchester*; the military way, called *Jennings-Street*, passed through it; and some vestiges of the ancient stone wall with which it was surrounded, and of the amphitheatre with which it was adorned, are still visible. The country of the Durotriges was included in the Roman province called *Flavia Cafariensis*, and governed by the president of that province, as long as the Romans kept any footing in these parts.

DURY (John), a Scots divine, who travelled much, and laboured with great zeal to reunite the Lutherans with the Calvinists. His discouragements in this scheme started another still more impracticable; and this was to reunite all Christians by means of a new explication of the Apocalypse, which he published at Francfort in 1675. He enjoyed then a comfortable retreat in the country of Hesse; but the time of his death is unknown: his letter to Peter du Moulin concerning the state of the churches of England, Scotland, and Ireland, was printed at London in 1658, by the care of du Moulin, and is esteemed to be curious.

DUSSELDORP, a city of Westphalia in Germany, and capital of the duchy of Berg. It is situated at the conflux of the river Duffel with the Rhine, in E. Long. 6. 20. N. Lat. 51. 15.

DUTCHY. See **DUCHY**.

DUTY, in general, denotes any thing that one is obliged to perform.

DUTY, in a moral sense. See *MORAL Philosophy*.

DUTY, in polity and commerce, signifies the impost laid on merchandizes, at importation or exportation, commonly called the duties of customs; also the taxes of excise, stamp-duties, &c. See **CUSTOMS**, **EXCISE**, &c.

The principle on which all duties and customs should be laid on foreign merchandizes which are imported into these kingdoms, are such as tend to cement a mutual friendship and traffic between one nation and another; and therefore due care should be taken in the laying of them, that they may answer so good an end, and be reciprocal in both countries: they should be so laid as to make the exports of this nation at least equal to our imports from those nations wherewith we trade, so that a balance in money should not be issued out of Great Britain, to pay for the goods and merchandizes of other countries; to the end that no greater number of our landholders and manufacturers should be deprived of their revenues arising from the product of the lands, and the labour of the people, by foreign importations, than are maintained by exportations to such countries. These are the national principles on which all our treaties of commerce with other countries ought to be grounded.

DUTY, in the military art, is the exercise of those functions that belong to a soldier: with this distinction, that mounting guard and the like, where there is no enemy directly to be engaged, is called duty; but their marching to meet and fight an enemy is called going on service.

DUUM-

Dury
||
Duty.

Duumviri-
rate
||
Dwarf.

DUUMVIRATE, the office or dignity of the duumviri. See the next article.

The duumvirate lasted till the year of Rome 388, when it was changed into a decemvirate.

DUUMVIRI, in Roman antiquity, a general appellation given to magistrates, commissioners, and officers, where two were joined together in the same functions.

DUUMVIRI Capitaes were the judges in criminal causes: from their sentence it was lawful to appeal to the people, who only had the power of condemning a citizen to death. These judges were taken from the body of the decuriones; they had great power and authority, were members of the public council, and had two lictors to walk before them.

DUUMVIRI Municipales, were two magistrates in some cities of the empire, answering to what the consuls were at Rome: they were chosen out of the body of the decuriones; their office lasted commonly five years, upon which account they were frequently termed *quinquinales magistratus*. Their jurisdiction was of great extent: they had officers who walked before them, carrying a small switch in their hands; and some of them assumed the privilege of having lictors, carrying axes and the fasces, or bundles of rods, before them.

DUUMVIRI Navales, were the commissaries of the fleet, first created at the request of M. Decius, tribune of the people, in the time of the war with the Samnites. The duty of their office consisted in giving orders for the fitting of ships, and giving their commissions to the marine officers, &c.

DUUMVIRI Sacrorum, were magistrates created by Tarquinius Superbus, for the performance of the sacrifices, and keeping of the sibyls books. They were chosen from among the patricians, and held their office for life: they were exempted from serving in the wars, and from the offices imposed on the other citizens, and without them the oracles of the sibyls could not be consulted.

DUYVELAND, or **DIVELAND**, one of the islands of Zealand, in the United Provinces, lying eastward of Schonen, from which it is only separated by a narrow channel.

DWAL, in heraldry, the herb nightshade, used by such as blazon with flowers and herbs, instead of metals and colours, for fable or black.

DWARF, in general, an appellation given to things greatly inferior in size to that which is usual in their several kinds: thus there are dwarfs of the human species, dwarf-dogs, dwarf-trees, &c.

The Romans were passionately fond of dwarfs, whom they called *nani* or *nanae*, inasmuch that they often used artificial methods to prevent the growth of boys designed for dwarfs, by inclosing them in boxes, or by the use of tight bandages. Augustus's niece, Julia, was extremely fond of a dwarf called *Sonopas*, who was only two feet and an hand-breadth high.—We have many other accounts of human dwarfs, but most of them deformed in some way or other besides the smallness of their size. Many relations also concerning dwarfs we must necessarily look upon to be fabulous, as well as those concerning giants.—The following history, however, which we have reason to look upon as authentic, is too remarkable not to be acceptable to the generality of our readers.

Dwarf.

Jeffery Hudson, the famous English dwarf, was born at Oakham in Rutlandshire in 1619; and about the age of seven or eight, being then but 18 inches high, was retained in the service of the duke of Buckingham, who resided at Burleigh on the Hill. Soon after the marriage of Charles I. the king and queen being entertained at Burleigh, little Jeffery was served up to table in a cold pye, and presented by the duchess to the queen, who kept him as her dwarf. From 7 years of age till 30, he never grew taller; but after 30, he shot up to three feet nine inches, and there fixed. Jeffery became a considerable part of the entertainment of the court. Sir William Davenant wrote a poem called *Jeffreidos*, on a battle between him and a turkey-cock; and in 1638, was published a very small book, called the *New Year's Gift*, presented at court by the lady Parvula to the lord Minimus (commonly called *Little Jeffery*) her majesty's servant, &c. written by Microphilus, with a little print of Jeffery prefixed. Before this period, Jeffery was employed on a negociation of great importance: he was sent to France to fetch a midwife for the queen; and on his return with this gentlewoman, and her majesty's dancing-master, and many rich presents to the queen from her mother Mary de Medicis, he was taken by the Dunkirkers. Jeffery, thus made of consequence, grew to think himself really so. He had borne with little temper the teasing of the courtiers and domestics, and had many squabbles with the king's gigantic porter. At last, being provoked by Mr Crofts, a young gentleman of family, a challenge ensued: and Mr Crofts coming to the rendezvous armed only with a squirt, the little creature was so enraged, that a real duel ensued; and the appointment being on horseback with pistols, to put them more on a level, Jeffery, with the first fire, shot his antagonist dead. This happened in France, whither he had attended his mistress in the troubles. He was again taken prisoner by a Turkish rover, and sold into Barbary. He probably did not remain long in slavery: for at the beginning of the civil war, he was made a captain in the royal army; and in 1644 attended the queen to France, where he remained till the Restoration. At last, upon suspicion of his being privy to the Popish plot, he was taken up in 1682, and confined in the Gatehouse, Westminster, where he ended his life, in the 63d year of his age.

In the Memoirs of the Royal Academy of Sciences, a relation is given by the Count de Tressau, of a dwarf called *Bebe*, kept by the late Stanislaus king of Poland, and who died in 1764 at the age of 23, when he measured only 33 inches. At the time of his birth, he measured only between eight and nine inches. Diminutive as were his dimensions, his reasoning faculties were not less scanty; appearing indeed not to have been superior to those of a well-taught pointer: but that the size and strength of the intellectual powers are not affected by the diminutiveness or tenuity of the corporeal organs, is evident from a still more striking instance of littleness, given us by the same nobleman, in the person of Monsieur Borulawski, a Polish gentleman, whom he saw at Luneville, who has since been at Paris, and who at the age of 22 measured only 28 inches. This miniature of a man, considering him only as to his bodily dimensions, appears a giant with regard to his mental powers and attainments.

Dwarf,
Dwina.

ments. He is described by the count as possessing all the graces of wit, united with a sound judgment and an excellent memory; so that we may with justice say of M. Borulawski, in the words of Seneca, and nearly in the order in which he has used them, "*Posse ingenium fortissimum ac beatissimum sub quolibet corpuscula latere.*" Epist. 66.

Count Borulawski was the son of a Polish nobleman attached to the fortunes of king Stanislaus, who lost his property in consequence of that attachment, and who had six children, three dwarfs, and three well-grown. What is singular enough, they were born alternately, a big one and a little one, though both parents were of the common size. The little count's youngest sister was much less than him, but died at the age of 23. The count continued to grow till he was about 30, and has at present attained his 51st year, and the height of three feet two inches. He never experienced any sickness, but lived in a polite and affluent manner under the patronage of a lady, a friend of the family, till love at the age of 41 intruded into his little peaceful bosom, and involved him in matrimony, care, and perplexity. The lady he chose was of his own country, but of French extraction, and the middle size. They have three children, all girls, and none of them likely to be dwarfs. To provide for a family now became an object big with difficulty, requiring all the exertion of his powers (which could promise but little) and his talents, of which music alone afforded any view of profit. He plays extremely well upon the guitar: and by having concerts in several of the principal cities in Germany, he raised temporary supplies. At Vienna he was persuaded to turn his thoughts to England, where it was believed the public curiosity might in a little time benefit him sufficiently to enable him to live independent in so cheap a country as Poland. He was furnished by very respectable friends with recommendations to several of the most distinguished characters in this kingdom, as the duchess of Devonshire, Rutland, &c. &c. whose kind patronage he is not backward to acknowledge. He was advised to let himself be seen as a curiosity, and the price of admission was fixed at a guinea. The number of his visitors, of course, was not very great. After a pretty long stay in London he went to Bath and Bristol; visited Dublin and some other parts of Ireland; whence he returned by way of Liverpool, Manchester, and Birmingham, to London. He also visited Edinburgh and some other towns of Scotland. In every place he acquired a number of friends. In reality, the ease and politeness of his manners and address please no less than the diminutive, yet elegant, proportions of his figure astonish those who visit him. His person is pleasing and graceful, and his look manly and noble. He speaks French fluently, and English tolerably. He is remarkably lively and cheerful, though fitted for the most serious and rational conversation. Such is this wonderful little man—an object of curiosity really worthy the attention of the philosopher, the man of taste, and the anatomist. His life has been published, written by himself.

DWINA, the name of two large rivers; one of which rises in Lithuania, and, dividing Livonia from Courland, falls into the Baltic Sea a little below Riga: the N° 105.

other gives name to the province of Dwina in Russia, discharging itself into the White Sea a little below Archangel.

DYCK. See VANDYCK.

DYE, in architecture, any square body, as the trunk or notched part of a pedestal: or it is the middle of the pedestal, or that part included between the base and the cornice; so called because it is often made in the form of a cube or dye. See ARCHITECTURE, n° 61.

DYER, a person who professes the art of dyeing all manner of colours. See DYEING.

DYER (Sir James), an eminent English lawyer, chief judge of the court of common pleas in the reign of Queen Elizabeth. He died in 1581; and about 20 years after was published his large collection of Reports, which have been highly esteemed for their succinctness and solidity. He also left other writings behind him relative to his profession.

DYER (John), the son of Robert Dyer, Esq; a Welsh solicitor of great capacity, was born in 1700. He passed through Westminster-school under the care of Dr Freind, and was then called home to be instructed in his father's profession. His genius, however, led him a different way; for besides his early taste for poetry, having a passion no less strong for the arts of design, he determined to make painting his profession. With this view, having studied a while under his master, he became, as he tells his friend, an itinerant painter, and wandered about South Wales and the parts adjacent; and about 1727 printed Grongar Hill. Being probably unsatisfied with his own proficiency, he made the tour of Italy; where, besides the usual study of the remains of antiquity, and the works of the great masters, he frequently spent whole days in the country about Rome and Florence, sketching those picturesque prospects with facility and spirit. Images from hence naturally transferred themselves into his poetical compositions: the principal beauties of The Ruins of Rome are perhaps of this kind; and the various landscapes in The Fleece have been particularly admired. On his return to England, he published The Ruins of Rome, 1740; but soon found that he could not relish a town-life, nor submit to the assiduity required in his profession. As his turn of mind was rather serious, and his conduct and behaviour always irreproachable, he was advised by his friends to enter into holy orders; and it is presumed, though his education had not been regular, that he found no difficulty in obtaining them. He was ordained by the bishop of Lincoln, and had a law degree conferred on him.

About the same time he married a lady of Colehill named Enfor; "whose grandmother (says he) was a Shakespeare, descended from a brother of every body's Shakespeare." His ecclesiastical provision was a long time but slender. His first patron, Mr Harper, gave him, in 1741, Calthorp in Leicestershire, of 80 l. a-year, on which he lived ten years; and in April 1757 exchanged it for Belchford in Lincolnshire, of 75 l. which was given him by lord chancellor Hardwicke, on the recommendation of a friend to virtue and the muses. His condition now began to mend. In 1752, Sir John Heathcote gave him Coningsby, of 140 l. a-year; and in 1756, when he was LL. B. without any solicitation of his own, obtained for him from the chancellor Kirby

Dyck
||
Dyer.

Dyer. on Bane, of 1101. In 1757, he published *The Fleece*, his greatest poetical work; of which Dr Johnson relates this ludicrous story. Dodsley the bookseller was one day mentioning it to a critical visitor, with more expectation of success than the other could easily admit. In the conversation the author's age was asked; and being represented as advanced in life, "He will (said the critic) be buried in woollen." He did not indeed long outlive that publication, nor long enjoy the increase of his preferments; for a consumptive disorder, with which he had long struggled, carried him off at length in 1758.

Mr Dyer's character as a writer has been fixed by three poems, *Grongar Hill*, *The Ruins of Rome*, and *The Fleece*; wherein a poetical imagination perfectly original, a natural simplicity connected with and often productive of the true sublime, and the warmest sentiments of benevolence and virtue, have been universally observed and admired. These pieces were put out separately in his lifetime: but after his death, they were collected and published in one volume 8vo, 1761; with a short account of himself prefixed.

Dyer's Weed.

Dyer's Weed, in botany. See *RESEDA*.

D Y E I N G,

IN the utmost latitude of the word, may be defined, The art of tingeing cloth, stuff, or other matter, with a permanent colour, which penetrates the substance thereof.—It is, however, commonly restrained to the art of tingeing silk, wool, cotton, and linen, with different colours; and, as such, is practised as a trade by those who do not meddle with any of the other branches, as staining of leather, &c.

I Antiquity of the art.

The dyeing art is of great antiquity; as appears from the traces of it in the oldest sacred as well as profane writers. The honour of the invention is attributed to the Tyrians; though what lessens the merit of it is, that it is said to have owed its rise to chance. The juices of certain fruits, leaves, &c. accidentally crushed, are supposed to have furnished the first hint: Pliny assures us, that even in his time the Gauls made use of no other dyes. It is added, that coloured earths and minerals, washed and soaked with rain, gave the next dyeing materials.—But purple, an animal juice found in a shell-fish called *murex**, *conchylium*, and *purpura*, seems from history to have been prior to any of them. This indeed was reserved for the use of kings and princes; private persons were forbidden by law to wear the least scrap of it. The discovery of its tingeing quality is said to have been taken from a dog, which having caught one of the purple fishes among the rocks, and eaten it up, stained his mouth and beard with the precious liquor; which struck the fancy of a Tyrian nymph so strongly, that she refused her lover Hercules any favours till he had brought her a mantle of the same colour.

* See *Murex*.

Pliny seems to ascribe the invention of the art of dyeing wool to the Lydians of Sardis: *Incipere lanas Sardibus Lydi*; where the word *incipere* must be understood. But a modern critic suspects a false reading here; and, not without reason, for *Lydi* substitutes *Lydda*, the name of a city on the coast of Phenicia, where the chief mart of the purple dye was.

After the Phenicians, the Sardinians seem to have arrived at the greatest perfection in the dyeing art; in so much that βαμμα Σαρδινιακον, *Sardinian dye*, passed into a proverb among the Greeks. Till the time of Alexander, we find no other sort of dye in use among the Greeks but purple and scarlet.—It was under the successors of that monarch that these people applied themselves to the other colours; and invented, or at least perfected, blue, yellow, green, &c.—For the ancient purple, it has been long lost; but the perfection

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to which the moderns have carried the other colours, abundantly indemnifies them of the loss. It is still, however, greatly to be doubted whether the permanency of the modern colours at all equals that of the ancient ones; though it is certain that the former greatly exceed them in brightness.

SECT. I. Theory of Dyeing.

BEFORE we can enter into any consideration of the true theory of dyeing, it is necessary to make the following observation concerning the practice, namely, That salts are almost the only means we are acquainted with by which any colouring substance can be made to fix itself upon those matters which are the common subjects of dyeing. A solution of cochineal, for instance, will of itself impart no permanent colour to a piece of woollen cloth put into it. The red colour of the cochineal will indeed stain the cloth while it remains immersed in the solution; but as soon as it is taken out and washed, this temporary stain will immediately vanish, and the cloth become as white as before. If now the cloth is dipped in the solution of any saline substance, alkalies alone excepted, and then immersed in the solution of cochineal for some time, it will come out permanently coloured; nor will the colour be discharged even by washing with soap and water. If a quantity of salt is added to the solution of cochineal, and the cloth put in without being impregnated with any saline substance, the effect will be the same; the cloth will come out coloured; only in this last case, it must be well dried before washing it with soap, or most of the colour will be discharged.

² Salts the only means of fixing colours.

By comparing this with what is delivered under the article *COLOUR-Making*, n^o 13, 14. we shall be able to form a pretty rational theory of dyeing. It is there remarked, that a saline substance (solution of tin in aqua regia) had a surprising power of coagulating the colouring matter of certain solutions, such as cochineal, Brazil-wood, logwood, &c. If therefore a piece of cloth is previously impregnated with this solution, and put into the colouring one, it is plain that some part of the colouring matter will be coagulated by the solution remaining in the cloth, in the very same manner that it would have been if a small quantity of the saline solution had been poured into the other. The cloth therefore will take up a part of the colouring matter, which cannot be discharged but by entirely discharging the solution of tin. This, however, seems to unite

³ They operate by coagulation.

A a

itself

itself with the cloth very firmly, so that scarce a particle of colour will be discharged by washing in plain water, or even with soap; nor can the whole be taken out without boiling the cloth in a solution of fixed alkali.

Though solution of tin produces this coagulation in the most remarkable manner, it is not to be doubted that the same power is possessed in some degree by most of the neutrals and imperfect salts. Alum possesses it very considerably, though not so much as solution of tin; and hence that salt is very much used in dyeing, as well as sugar of lead, which also has a very strong power of coagulation. The process of dyeing, therefore, seems to be most analogous to that of the coagulation or curdling of milk. Before it has suffered this change, the milk is easily miscible with water; but after it is once coagulated, the curd, or caseous part, is very difficultly soluble in any liquid whatever. In like manner, the colouring matter in the solution of cochineal, before the cloth is put in, is easily soluble in water, and may be diffused through any quantity of fluid: but no sooner is the cloth dipped in it, than the saline substance contained in the cloth coagulates that part of the colouring matter which lies in immediate contact with it; and as all the fluid successively comes into contact with it, the whole of the colour is by degrees coagulated and deposited on the cloth.

4
Hypotheses
concerning
the adhe-
sion of the
colour.

To account for the strong adhesion of the colour to the dyed cloth, several hypotheses have been formed. One is, That the fibres of wool, silk, &c. are hollow tubes; that the colouring matter enters them; and, after being there coagulated, shows itself through the fine transparent sides of the tubes.—Another considers these filaments as solid lengthwise, but having all round their sides an infinite number of small pores like the extremities of the fine absorbing and exhaling vessels of the human body. In these pores, according to the hypothesis, the colour is lodged; and as the pores are placed exceedingly close to one another, the fine threads appear to our eyes of one uniform colour.—A third is, That the fibres are solid; or at least with respect to us may be considered as such. The saline substance, whatever it is, that is employed to make the colour strike, sinks into the surface, partly corrodes and unites itself with it into a third kind of substance no longer soluble in plain water, nor even easily by soap, but which still preserves its coagulating quality. According to this hypothesis, the dye lies entirely on the outside of the stuff, and continues as long as the effect of the salt continues upon the fibres of the matter to be dyed.

5
M. Hellot's
theory dis-
proved.

Concerning the truth of these hypotheses, or indeed any others that can be invented, it is impossible to bring any decisive proof. It seems, however, more probable, that the process of dyeing is accomplished by a coagulation of the colouring matter itself, rather than by any agglutination of it to the fibres by means of a vitriolated tartar, as Mr. Hellot supposes. According to this gentleman's theory, a vitriolated tartar is generated in every process for dyeing, and proceeds from the acid of the alum and alkaline basis of the tartar used in the preparations, or in some of the dyeing ingredients themselves. He supposes that the pores of the stuff are cleansed and enlarged by the preparatory salts, and by the boiling water, in such a manner as to

receive the colouring particles, which particles are afterwards detained by the contraction of the pores occasioned by cold; and further, that these pores are lined with a saline crust of tartar or vitriolated tartar.

On this theory the translator of the Chemical Dictionary has the following observations. "Mr. Hellot has not shown that pure fixed alkali is incapable of producing the effects which he attributes to his tartar and vitriolated tartar; and both these salts, though they are difficult of solution, and require a great quantity of water for this purpose, will yet dissolve at last; and therefore, if the colouring particles were fixed chiefly by means of these salts, they might be washed out by a large quantity of water; which we find to be contrary to experience."

6
"We shall find it more difficult to substitute a true theory than to refute that of Mr. Hellot. Many experiments ought to be previously made. Nevertheless, it may be observed, That the colorific particles of most substances used in dyeing seem to be insoluble in water, in spirit of wine, and even in alkaline lixiviums: that their diffusion through these liquids is caused merely by their adhesion to certain gummy and resinous particles: and that they may be disengaged from those gummy and resinous matters, by applying a piece of stuff to which they have a greater adhesive power, which seems to be the case of the root-coloured and blue dyes; or by applying another substance to which these particles have a greater power of adhesion; such as the earth of alum, in those dyes where that salt is used, together with some other substance, as fixed or volatile alkali, capable of decomposing alum; or as the ferruginous earth of the green vitriol in black dyes, to which the colorific particles of the galls adhere; which earths are capable of applying themselves and of adhering to the stuffs. The separation of the colouring particles from the gummy and resinous matters is probably facilitated by the addition of acids and neutral salts, which may coagulate in some measure the vegetable matters, and leave the colorific particles disengaged; so that they may apply themselves to the stuff, or to the earths above mentioned."

7
In a treatise on this subject by M. de Apligny, the nature of the different substances usually subjected to this operation is particularly considered. These are wool, silk, cotton, and linen. Wool was probably the first substance to which any kind of dye was applied, and which might probably have been done even in the fleece, while mankind, in their rude state, wore the skins of animals. When some further progress in arts was made, and the method of manufacturing wool into worsted and cloth discovered, the dye would then be applied to it; but it was not till a considerable time afterwards that silk and cotton were known; and the art of dyeing linen is mentioned as a new invention even in the time of Pliny.

Wool, according to our author, consists of tubes, which, like hair, contain a medullary substance, but throughout their length are sieves with an infinite number of lateral pores; and in proportion to the greater or lesser number of these pores, the woolly fibres are more or less curled. The reason assigned for this is, that "the more interruptions there are in the continuity of any body, the more flexible it will be: the fibres of the wool therefore being curled must have

many

many pores, and consequently great room for the extraneous substance which may be not only lodged in the exterior pores, but even penetrate into the whole extent of the tubes, after the medullary substance has been expelled. It is not therefore to be wondered at, if wool, being of all substances that are made into stuffs the most porous, should be the most easy to dye, and imbibe the greatest quantity of colour."

Silk, according to our author, may naturally be supposed to proceed originally from the mucilage of the mulberry leaf on which the animal feeds, and which he imagines is converted into an animal substance by a combination with volatile alkali; but which, by the evaporation of a thin oil, and part of this alkaline matter, becomes tough and hard. An example of something similar to this is observed on the leaves of the *ros folis*, on which there are found some drops, which being touched while the sun shines upon it may be drawn out into fine and very white threads. The consolidation of the silk is also promoted by a yellow substance with which the animal impregnates the thread; and this seems to be a concrete oil something similar to wax. Silk thread therefore is nothing else than a continued series of molecules of this indurated gluten: but as in this desiccation the molecules will remain at unequal distances, there will necessarily be inequalities, and consequently pores in the thread; but as these pores are only on the surface of the thread without any interior concavity as in the wool, it follows, that silk can admit no particles into its pores, but such as are extremely subtile and in very small quantities; that even the particles admitted require a stronger mastic or fixing substance than wool, since they are only superficial, and incapable of penetrating. Hence silk is much more difficult to dye permanently than wool, and requires likewise a much greater quantity of colouring materials; two ounces and a half of cochineal being required to give the same shade to a pound of silk that one ounce will give to a pound of wool. For the same reason also the colours on silk are less permanent than on wool.

Cotton being a true vegetable substance must necessarily have its fibres hollow like wool, that the juices may circulate properly; but as these are a great deal finer, the cotton is therefore much more difficult to dye. The exterior and lateral pores of cotton are likewise filled with a kind of oil, which it is necessary to expel before the dye can be given.

Flax may likewise be supposed porous, but that its pores are much smaller than those of any of the substances already mentioned. The detached and separated fibres resemble silk in some degree, only that, being more dry and compact, they take the dye with still more difficulty than even cotton; and from the different textures of these substances we may reasonably ascribe the different shades which are taken by them even when the same dyeing ingredients are made use of. This holds good also with respect to stuffs differently manufactured, though of the same kind; the pores being necessarily contracted by certain kinds of fabrication, whence they receive a smaller quantity of the dye: and hence scarlet cloth, when cut, appears white internally, the colouring atoms being too large to penetrate it, which, however, does not happen in the stuffs which have been previously dipped in solution of alum.—A difference of shade will also be oc-

caused by the different positions and delicacy of the fibres of the stuff; and by this also a difference is made in the brightness of the colour.

With regard to the operation of those substances commonly made use of for fixing the dye, our author remarks, that lime seems destined by the Author of nature for binding and uniting the two seemingly opposite substances of salts and earth. "Fire (says he) makes it soluble in water, and therefore easily used; but it again becomes indissoluble by the contact and influence of the air; and these properties render it capable of forming, when united to other bodies, an unalterable cement." We know several mixtures of this kind, of which lime is the basis, and that in consequence of these properties it confirms the solidity of many colours.

Alum has the property of attracting the colouring particles of the dye as well as of fixing them; and Pliny informs us that this property was known to the ancients. They made use of certain earths of the argillaceous kind, which they called *creta argentaria*, *salunifia*, and *anularia*, to imbibe the colour from infusions of dyeing ingredients; and they became much sooner saturated with the colour than wool itself. There are two kinds of alum made use of in dyeing, viz. roch alum and Roman alum. The first is always used for blues and the colours inclining to black; but as this generally contains some particles of iron, the Roman alum is preferred for the more lively colours, as it contains nothing capable of tarnishing their beauty. The colours are brightened by the whiteness of the earth, while its tenacity, produced by some kind of unctuousity with which it is combined, makes it more solid; and the plastic quality of the earth makes it take the form of the pores in the substance to be dyed; whence a greater permanency of colour must necessarily ensue.

There are several other saline substances made use of in dyeing, particularly nitre, sea-salt, sal ammoniac, and tartar, &c. By the three first the red colours are always rendered more dark-coloured, while the others enliven the colour and give it an orange hue. Neutral salts with a metallic basis serve to strengthen the colour, which varies its shade according to the nature of the metallic substance with which it is combined. Green and blue vitriol are the most commonly used in this art.

In explaining the theory of the art of dyeing, our author considers the whole as an effect of attraction; and in order to set forth this matter in a proper light, it is necessary, in the first place, to explain the conditions requisite for the action of bodies upon one another in this way. These conditions are, 1. That the attractive power be mutual in both. 2. That they should be placed at a distance from each other proportioned to the force of attraction. 3. That this force be superior to that by which the colouring matter is attracted by the water. Hence it is necessary for dyeing stuffs of any kind, that the dye should consist of small particles suspended in a liquid, in such a manner that they may be separated by a substance which has a greater affinity with these minute bodies than water. Some of these substances, however, are not attracted by the earth of alum, and these enter the pores of the cloth without its assistance; but in such as require the assistance of alum, the particles are fixed by the power of attraction, at the same time that the acid of the

8
Of the action of lime.

9
Of alum.

10
Dyeing supposed to be an effect of attraction.

alum is softened by its combination with the principles of these particles; this acid having served merely as a vehicle for distributing equally into all the pores of the stuff that earth which it held in a state of the greatest possible divisibility.

¹¹ Our author next proceeds to contest the theory, that salts, even such as are the most insoluble, can maintain their stability in the pores of the stuff, however insoluble the salt may be in water. He observes that this insolubility, however great, could not prevent a great quantity of it from being carried off by water, and consequently the colour from being injured by the decomposition of these salts; but fixed earth, such as that of lime and alum, which from its nature obstinately retains the phlogistic principles of all colours, must necessarily produce such as cannot be destroyed but by the strongest acids.

¹² Colours, in the opinion of our author, depend entirely upon phlogiston. It is well known that, by the simple addition of any salt to an oily, vegetable, and colouring substance, we may either change or totally expel its colour; because any salt, either simple or compound, destroying the combination then subsisting, a new reflection of the rays of light must necessarily take place. In such substances therefore as cannot have their colour affected by any salt, the phlogiston is most probably in the most perfect combination with the other principles. Were we thoroughly acquainted with this combination, we should be able to make perfect compositions for dyeing, similar to what artificial cinnabar is for painting: but though we certainly know the effects produced upon some kinds of oils by salts, and can decompose some colouring substances and separate their principles, we are still unacquainted with the manner in which these principles are combined; and therefore every effort of this kind has hitherto been found insufficient for the purpose.

¹³ Apligny's account of the action of acids and alkalies upon colouring substances. "As the colour (says our author) depends upon the shape or figure of the constituent particles of the colouring bodies, the shade may be varied by changing their figure, but the permanency of the colour is at the same time diminished; because it is impossible to produce this change without altering the principles to which they owe their permanency; and this is the case with cochineal. The shades of its colour are easily varied by acids and alkalies."

M. de Apligny then proceeds to account for the action of acids and alkalies upon colouring substances. Cochineal is rendered darker by alkalies, and always becomes of a deep purple on adding them; and the volatile alkali is found to be more efficacious in this respect than the fixed kind. These salts he supposes to produce this effect, because they are natural solvents of animal substances; which, however, they are incapable of dissolving without combination, causing only a composition without the dissipation of any principle. This combination gives a degree of density to the colouring particles which they had not before; and thus inclines them to black, by occasioning a greater degree of refraction in the pencils of rays. Acids, on the other hand, especially those of the mineral kind, burn the oil, and absorb the phlogiston, which is the principle of all colours. By the violence of their action a part of the phlogiston and volatile alkali eva-

porates, the colouring matter becomes more rarefied, and reflects a greater number of the rays of light; whence it necessarily acquires a colour nearly yellow, and even quite so if a proper quantity be added; this being, according to our author, of all colours the nearest to white or transparency. Hence it is not customary for dyers to make any use of fixed alkali when cochineal is the colouring substance, as it would make too great an alteration in the consistence, and, by mixing with the animal oil, form a soap which would render the colour miscible in water, and consequently of the false kind of dye; the oil already mixed with fixed alkali being no longer at liberty to combine with the earth of alum. But after the substance has been already dyed, the fixed alkali may then be used with advantage in some cases; because the colouring substance being already converted into what our author calls a *massic*, cannot be dissolved by the menstruum unless the latter be used in very great quantity.

Acids, according to M. de Apligny, are more destructive in their action than alkalies; and the oil of vitriol, formerly used, always containing some ferruginous particles, a kind of Prussian blue was formed, which rendered the colour purple rather than otherwise; and even by simple boiling in an iron vessel, the solution of cochineal always assumes a purple colour. The activity of spirit of nitre, which has been substituted in place of oil of vitriol, is so great, that it has been found necessary to give it a basis on which it might in part exhaust itself, and, by communicating part of its phlogiston, render it less greedy of the cochineal. This basis is tin, which formerly was dissolved by spirit of nitre, but now by aqua regia, which was found to dissolve it more completely. Our author's method of using this solution, however, is not by diluting it in water, and then by dipping the stuffs in it previous to their being dyed. "This preparation (says he) would not be sufficient; for by diluting with a great quantity of water, a part of the calx would precipitate and be reduced into particles larger than when dissolved in acids, especially if used alone and separate from the dye; the acid in that case not acting on the colour with sufficient force to enliven it. Only part of this solution, therefore, is added to the cochineal liquor; and the acid then abandoning the tin, and combining with the oil of the cochineal, the calx of the metal seizes the colouring matter as it precipitates, and, as Mr Hellot observes, forms a kind of lacker which insinuates into the pores of the stuff, and is there retained by a gluten given by the starch which was added to the dyeing liquor. Hence it is easy to conceive why the scarlet dye is much less solid than the crimson; the lacker being much drier than the simple colouring particles of the cochineal, is in this state nearer to the nature of the mineral colours. The oil and the animal gluten, which in the crimson dye form with the earth of alum a *massic*, are destroyed by the acid, and the starch then added is an insufficient substitute."

The same thing that has here been mentioned of cochineal applies equally to gum-lac and kermes; both of which afford a scarlet dye. The kermes, he thinks, has the advantage of being composed of finer particles, which more easily penetrate the pores of silk or cotton. Silk indeed, on account of the smallness of its pores, takes up only a part of the cochineal; but it extracts the

the whole of the colour from the cochineal, and the colour is also more fixed, probably because the shrub on which the insect is nourished communicates its astringency, or contains a greater quantity of oil. Cotton may likewise be dyed with kermes, though cochineal cannot penetrate its pores.

But in whatever way the salts used in dyeing do act, it is certain they are capable, except in a very few instances, of fixing and giving a lustre and permanency to the colour which otherwise could never be obtained.

14
Exceptions
to the ge-
neral rule
concerning
salts.

The exception to this general rule most commonly known is that of indigo. This is a fine blue fecula produced by fermentation from the leaves of the Indian plant called *anil*. It is very difficult of solution; however, it may be dissolved by alkaline salts, concentrated oil of vitriol, orpiment, or combinations of sulphur with quicklime. If a quantity of indigo is dissolved in a fixed alkali (for volatile alkalies will not dissolve it), the solution is always green, which is the natural colour produced in all vegetable blues by the alkali: but if any piece of stuff is put into this solution, though it remains green while immersed in the liquid, the moment it comes in contact with the air, the dissolving power of the alkali is totally destroyed; the indigo is precipitated upon the cloth, resumes its native colour, and dyes the cloth blue.

The cause of this precipitation is very difficult to be investigated. Perhaps it may be owing to an attraction of fixed air by the alkali from the atmosphere, which renders the salt unable to dissolve the indigo any longer. The adhesion of the colour seems merely owing to an attraction between it and the cloth; for the alkaline salt can contribute nothing to this, but would rather have the contrary effect. Perhaps, however, the great solvent power possessed by alkaline salts, by perfectly clearing away every kind of sordes, may bring the indigo and cloth into nearer contact with each other, than when it is dissolved in any other way; and consequently the attraction will in these cases be the stronger. This seems to have some probability; for when indigo is dissolved in vitriolic acid, as in dyeing Saxon blue, the colour is much more easily discharged.

Another exception is in the juices of some vegetables, such as the nuts of the anarcadium. This produces, without addition, a most deep and lasting black, never to be washed out or discharged by any means whatever. Several other plants are to be found in different parts of the world, which give an indelible black stain upon linen without addition; and the colouring matter of these seems to adhere by means of a very tenacious gluten, with which it is mixed, and which, when once thoroughly dried, can never be again dissolved. In this respect, these black staining colours seem analogous to the *purpura* of the ancients; which stained indelibly without addition, and was of an exceedingly viscous and adhesive nature.

SECT. II. *Practice of Dyeing.*

THE materials for dyeing different colours are so many and various, that an enumeration of them all is scarce to be expected. The same difference, however, takes place among the materials for dyeing which we have observed to take place among those for COLOUR-

Making. Some ingredients produce durable colours, which cannot be discharged either by exposure to the air or by washing with soap: others, though they may be made to stand the action of soap pretty well, cannot by any means be enabled to resist the action of the air. These are distinguished by the different names of *true* and *false*, *permanent* and *fading*, &c.; nor is there any method yet discovered of giving the false colours an equal degree of durability with the true ones. This hath been attempted by mixing a permanent and a fading colour together; in which case it was thought that the former would impart somewhat of its durability to the latter: but this hath always been found to misgive; the fading colour soon flying off, and leaving the permanent one behind. Nay, in many cases this does not even happen; for, by some means hitherto not accounted for, the volatile colour imparts its volatility to that which would otherwise be permanent. The same hath also been attempted by dyeing a piece of stuff partially with a fading colour, and then completing the dye with a permanent one. In this case it was hoped that the fading colour being covered over, and defended from the injuries of the air by the permanent one, would necessarily become equally durable, or at least remain a much longer time than if the stuff was dyed with it alone. But this also hath been found ineffectual; and the fading colour hath been dissipated as soon when covered with a permanent one, as when left without any such cover.—Solution of tin in aqua regia will give most of these fading colours an high degree of beauty, and some share of durability, though even that is not able to make them equal to the others.—The most permanent dyes we have are cochineal and gum lac for fine reds and scarlets; indigo and woad for blue; and, when mixed in different proportions with cochineal or lac, for purple and violet colours. Weld, and some other vegetables, for yellow; and madder for coarse reds, purples, and blacks.—The fading colours are much more numerous. In this class are included Brazil-wood, logwood, peach-wood, red-wood, fustic, turmeric root, annatto, archil, &c. &c.

With regard to the salts made use of in dyeing, it hath been but too often customary to jumble together such a quantity of different ones, that it was not only impossible to know in what particular salt the virtue resided, but often the efficacy of the whole hath been totally destroyed, and the colour entirely spoiled by such injudicious management. It is proper, therefore, where a mixture of two or more salts is intended to be made for dyeing, first to try the change of colour produced by each of the salts upon the colouring substance. If the colours are nearly alike, the mixture may be safely made as to that particular. But if the two colours produced by the different salts are very different from one another, to mix them together must be very injudicious. Thus, suppose you want to dye scarlet, solution of tin in aqua regia produces the necessary change of colour on the decoction of cochineal, and converts it into a high flame-colour, which shows it to be a proper ingredient; but to the solution of tin, it would surely be the greatest absurdity to add a quantity of saccharum saturni, the effect of which is to change the colour of cochineal to a dull purple. But though the salts taken separately should produce a colour nearly similar, another thing must be regarded, namely, whether

15
True and
false dyes.

16

Salts to be
used in dye-
ing.

ther they can be mixed with safety to one another? It is the nature of many salts to destroy one another whenever they come into perfect contact by being dissolved in water. Thus, solution of tin and saccharum saturni destroy one another; and so do solution of tin and tartar or cream of tartar. To mix these together must therefore be absurd; and yet we find this last mixture ordered in almost every receipt for dyeing scarlet. It is also to be observed, that a mixture of different salts ought never to be made, out of a notion that the colour will keep the better on that account; for most commonly it will keep the worse. A single salt will answer for this purpose better than a hundred. A mixture should only be made where it is necessary to produce the colour desired; and if a dyer proceeds in this simple manner, he may not only attain to great perfection in the art from his own experience without being taught by others, but even make considerable discoveries; as dyeing is at present far enough from being brought to perfection.—The salts chiefly to be used in dyeing are fixed alkalies; solutions of tin in the vitriolic and marine acids, and in aqua regia; sugar of lead; cream of tartar; alum; oil of vitriol; and solution of iron in the acetous acid. By means of these, almost all kinds of colours may be dyed at an easy rate, and with very little trouble.

17
Primitive
colours in
dyeing.

With regard to the operative part of this business, M. Hellot observes, that the whole depends on the use of some colours called by the workmen *primitive*, but which have no relation to the colours called *primitive* by Sir Isaac Newton. The primitive colours used by dyers are in number five, viz. blue, red, yellow, fawn or root colour, and black. Each of these furnish a great number of shades, both according to the nature of the ingredients themselves, and the acid or alkaline substances with which they are mixed. Of these five colours only two should be prepared with ingredients which produce no colour themselves, but which, by their acidity, and the fineness of the earth they contain, dispose the pores of the substance to receive the dye. Those colours which in a more particular manner require such a preparation are the red and yellow, with such others as are derived from them. Black requires a particular preparation; but blue and fawn colour none, at least for wool; it being sufficient for the purpose to scour and soak this substance well; after which nothing more is required than to plunge it into the vat, stirring it well about, and letting it remain for a longer or shorter time as the colour is intended to be more or less deep.

18
Ingredients
used in dye-
ing blue.

The ingredients used in dyeing blue are by our author determined to be three in number, viz. *pastel*, *woad*, and *indigo*.

Pastel, called in Latin *isatis* or *glasium*, is prepared by gathering it when come to maturity, suffering it to rot, and then making it up into balls for drying. For this purpose it is cultivated in Languedoc, and is made up into balls of 150 or 200 pounds weight. These resemble a collection of little dry lumps of earth intermixed with fibres of plants. For extracting the colour, the dyer must provide himself with large wooden vats of a magnitude proportioned to the quantity of stuff to be used. Mr Hellot recommends them from ten to twelve feet in diameter, and six or seven in height. They should be made of staves six inches

broad and two inches thick, bound with iron hoops about two or three feet asunder. They are to be sunk in the ground for the more easy management of their contents, which is done by means of hooks fastened to the end of a staff, the length of which is proportioned to the diameter of the vat. The bottom is made of lime and cement, though it might be made of wood, were it not for the difficulty of getting a wooden bottom strong enough to support the weight. The vats used for dyeing cottons of a blue colour, as M. de Apligny informs us, are generally formed of large brandy pipes newly emptied, or of oil hogsheads containing about 500 quarts. Before the latter are made use of, they ought to be well cleansed, by flaking lime in them, and scrubbing with a broom till the oily matter is thoroughly dissolved by means of the lime.

The preparation of the blue vat is the most difficult operation in the whole art of dyeing; and for this our author gives the following directions: "Your copper cauldron should be placed as near as possible to the vat, and then filled with pond-water. If the water be not sufficiently putrid, you put in a handful of hay, viz. two or three pounds, with eight pounds of brown madder, or the bark of the root. If you could have the old liquor of a madder vat, it would save fresh madder, and have a better effect. The fire should be lighted about three in the morning, and the mixture should boil an hour and a quarter; though some continue the boiling for two hours and an half or three hours. The liquor is now to be conveyed into the vat by means of a spout, the vessel being very clean, and having a hatful of wheaten bran at the bottom. The pastel balls are to be put into the vat one after another while the liquor is running into it, that they may be more easily broken, stirred, and mixed with the rake, an instrument composed of a strong semicircular piece of wood, with a long wooden handle. The mixture should be continually stirred till all the hot liquor is emptied out of the copper into the vat; and when the latter is rather better than half full, it should be covered with a lid a little larger than the circumference. There should also be a cloth put over it, to confine the heat as much as possible; after which the whole should be allowed to remain four hours. It ought then to be uncovered, in order to mix it thoroughly, and to give it air. About an handful of lime ought now to be put in for every ball of pastel; and after scattering in this substance, the vat should again be mixed and covered as before, except about an handbreadth to let in the air. In four hours after it should again be stirred, but without giving it any more lime; then it is to be covered and suffered to stand for three hours longer, leaving a small opening for air as before. At the end of three hours it may again be uncovered and well stirred; and if it be not yet ready and *come to*, according to the language of the dyers, that is, if the blue does not rise to the surface, but that it still foams, which may be known by striking with the flat of the rake, it will be necessary, after stirring it well, to let it stand an hour and an half longer, watching it carefully during that time in case it should cast blue. You then supply it with more water till the vat is full, putting in as much indigo as you think proper.

"The indigo used for this purpose should be in solution; and in order to dissolve it you must have a separate

19
Prepara-
tions of the
blue pastel
vat.

parate cauldron and furnace, and the vessel sufficient for dissolving 80 or 100 pounds of indigo must contain 30 or 35 buckets of hard water. This should be made into a lixivium, by putting 25 buckets of clear water into the copper with the addition of a hatful of bran, 12 or 13 pounds of madder, and 40 of good pot-ash; that is, half a pound of alkaline salt and two ounces and a half of madder to each pound of indigo. It should boil quickly for three quarters of an hour; after which the fire should be taken away from the furnace, and the residuum stand for half an hour, in order to let the sediment fall to the bottom. The clear liquor is then poured into a clean cask placed close to the copper. Take out the grounds at the bottom of the copper, wash it clean, return the lixivium into the copper, light a small fire under it, and at the same time put into the copper 80 pounds of indigo reduced to a gross powder. The liquor should then be made very hot, but not suffered to boil; and to facilitate the solution, it must be kept continually stirring with a small rake, to prevent it from gathering into lumps, or from burning to the bottom of the copper. The liquor should be kept moderately hot, and of as equal a degree of heat as possible, by throwing into it from time to time some lixivium of lime, which should be at hand ready prepared, in order to cool it. As soon as you perceive that there are no longer any lumps in the bottom of the copper, and that the indigo is well dissolved and diluted, the fire is to be withdrawn from the furnace, leaving only a few hot cinders to keep it warm. Cover up the copper then, and put in a pattern of stuff, which ought to be green when taken out, and turn blue immediately on being exposed to the air. Should this not be the case, some fresh and clear lixivium, prepared as just now directed, must be added.

"In preparing the pastel-vats, one common dye-house kettle full is to be put in for every ball of pastel; the vessel is then to be filled within six fingers breadth of the edge, when it is to be well mixed and covered as before.

"An hour after the vat has been supplied with water, it must have two measures (about two handfuls) of lime for every ball of pastel, or in proportion as it is thought that it will be required; but as some kinds of pastel require much less preparation than others, it is impossible to give any accurate directions upon the subject. In general, however, the lime should not be scattered in till the vat be well stirred.

"Having again covered the vat, a pattern is to be put in at the end of three hours, which should also be kept three hours immersed in the liquor, when it is to be taken out, in order to examine the state of the vat. The pattern, as has already been observed, ought to be green when immediately taken out, but instantly to turn blue; and if it is of a good green, you stir the vat, adding one or two handfuls of lime, and then cover it. Three hours afterwards it is to be stirred again, adding more lime if necessary. Cover it then for an hour and an half longer; and when the matter is settled, immerse a pattern, which must remain for an hour, and then be inspected to know the state of the pastel. If the pattern be of a good green when taken out, and becomes a deep blue when exposed to the air, another pattern is to be put in, in order to ascertain the effect of the vat. Should the colour of the pattern be suffi-

ciently high, the vat is to be filled with hot water, or, if it can be procured, the liquor of an old madder vat, and then stirred again. If the vat wants lime, a sufficient quantity must be added according to the smell, and as it may be found necessary during the working. This being done, and the vat brought to a proper state, it is to be once more covered for an hour; after which the stuffs are to be immersed in it."

This operation is supposed by some dyers to be impracticable, except upon a very large scale; but M. Hellot's method of preparing a blue vat on a small scale. Hellot has made some experiments on this subject, which seem to evince the contrary. For this purpose he took a little barrel containing about 25 gallons, and put it into a copper full of water kept carefully heated. He then put 20 gallons of water into a small copper with an ounce and a half of madder, and a very small handful of dyer's weed; which last, however, he does not suppose to be of any use. Having made the whole to boil together for three hours, he poured all the liquor into the barrel about nine in the evening, previously putting into it two small handfuls of bran. At the same time he added four pounds of pastel; and having stirred it well for a quarter of an hour, he covered it up, and took care to have it stirred every three hours during the night. It is customary to put some four water into the large vats, but this was omitted in the present case; and the bran, which soured with the liquor, was found to be a sufficient substitute. Next morning the mixture was found to be in a state of fermentation, frothing up and making an hissing noise. On mixing it well, and adding an ounce and an half of flaked lime, the froth was increased; and as the smell became stronger, it was judged proper to add a little more pastel. At half an hour after ten the vat smelt stronger of the lime; a pattern was put into it; and at the expiration of an hour, it was taken out green; and which, on being exposed to the air, became blue. On being stirred, another pattern was put in about an hour afterward; which having also remained an hour immersed in the liquor, came out afterwards of a deeper blue than the former. At half an hour after twelve two ounces of indigo, not dissolved, but only powdered, sifted, and diluted with hot water, were put in, with about the bigness of a walnut of the *cendres gravelees* or burnt lees of wine, which contain a large quantity of alkaline salt; and every two hours afterwards a pattern was put in an hour after stirring the vat, letting each also remain an hour in the liquor. This was continued till ten o'clock; and the last patterns were not only evidently darkest, but of the brightest colour.

The last pattern showed that the lime was exhausted; but on account of the lateness of the hour, our author added only another half ounce of lime, and an hour after put in another pattern; which after having remained an hour in the liquor, was taken out more blue than the rest, though the colour had been rendered less lively by the lime. Two other patterns put in during the night were still darker, though the colour was somewhat dull; an evidence that the lime was not yet exhausted. The paste which lay at the bottom was of a yellowish brown when taken out, but by exposure to the air became of an olive green. Under the surface it appeared of the same colour if moved with the hand, but instantly became green, smelling rather strong, though not very much of the lime. The liquor itself

itself was of the colour of beer, but the scum or froth of a blue colour. Patterns were now put in every two hours till two in the afternoon; when that which was taken out appeared of such a fine blue, that it was judged proper to fill the vat. For this purpose about eight gallons of water were put into a little copper with a quarter of an ounce of madder and an handful of bran; and when it had boiled for half an hour, the liquor was put into the little vat for three hours. On stirring and letting it then remain for an hour afterwards, a pattern was put in, which in an hour's time was taken out of a beautiful blue. An ell of serge was then immersed by means of what our author calls a *cross*; which is an iron hoop with a net fastened to it, the meshes of which are about an inch square; and the whole may be suspended at any height required by means of three or four cords fastened to it. The serge had no other preparation than being made thoroughly wet; nevertheless, in about a quarter of an hour it was taken out very green, and on being wrung out turned blue; but on a second immersion for another quarter of an hour, the colour turned out much more lively and brighter than could have been expected. The experiment was repeated with a pound of worsted; but the vat had been so much exhausted that it came out only a slye blue; however, by sprinkling in about half an ounce of fresh lime, the colour was afterwards made sufficiently deep.

21
His directions for working the pastel vat.

For working this vat our author gives the following directions. 1. It is in a proper state for working, *i. e.* for imparting the blue colour to the stuffs put into it, when the sediment or grounds at the bottom is of a fine brown green; when it changes upon being taken out of the vat; when the froth which rises to the top is of a fine Persian blue; and when the pattern, which had been steeped for an hour, is of a fine green colour. 2. The vat is also in a proper state for working, when the liquor is clear and reddish, and the drops which adhere to the rake are of a brown colour. 3. When the liquor is neither harsh nor too greasy to the feel, and when it smells neither of lime nor of the lixivium. 4. It may be known when too much lime has been put in, by the colour of the pattern immersed in the liquor; which, instead of being a fine grass green, will be only a dirty greyish blue, or some other colour of that kind. The same thing may likewise be understood when the sediment does not change colour; when there is scarce any efflorescence on the vat; and when the liquor smells only of lime or lixivium.

In order to rectify the state of the vat in this case, several methods have been recommended by practical dyers. 1. Some use tartar or bran, adding a quantity of either as occasion may require. 2. Others attempt to correct it by throwing in a bucket of urine. 3. Sometimes they use a large iron stove, which may reach from the grounds at the bottom to the top of the vat. This machine is furnished with a grate about a foot from the bottom, and an iron funnel, one end of which commences with the grate, and communicates with the external air. On forcing down the stove to the bottom of the vat, where it ought to be retained by iron bars, the heat of the stove will force up the lime to the top, where as much as is required may be taken out by a sieve. 4. Some

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dyers correct a vat which has got too much lime with urine and tartar: but the best method, according to our author, is to put into it a sufficient quantity of bran and madder; and if the excess of lime is not very great, it may be allowed to stand four, five, or six hours, or more, adding to it two hatfuls of bran and three or four pounds of madder, which should be slightly sprinkled on the top without any covering. At the end of four or five hours it should then be stirred by a rake, and a pattern put in to try the effect of it. If the blue does not rise until it be cold, it ought to have time to recover, by allowing it to stand without disturbance, which sometimes requires whole days to accomplish; but, in general, the lime which seems to want strength to carry on the fermentation, revives and prevents the vat for some time from yielding any colour. To bring it forward, some bran and madder should be sprinkled on the top, besides an addition of two full baskets of fresh pastel, which assists the liquor, when heated again, in dissolving the lime. 5. The vat ought now to be frequently tried by putting in a pattern, that from one hour to another you may be able to judge by the green colour how far the lime has operated. Thus the operation may be accurately conducted; for when the vat has suffered either by too much or too little lime, it is very difficult to manage it. 6. If, during the time that you are thus employed in retrieving the vat, it should cool too fast, you must endeavour to preserve the heat by emptying some of the liquor, and replacing it with hot water; for when the liquor grows cold, neither the pastel nor lime are consumed but in very small quantity. The action of the lime is also retarded by too great a degree of heat; and in this case it is proper rather to wait a little than to be in too great a hurry to restore the vats. 7. It is evident that the vat has suffered by not being sufficiently supplied with lime, when there are no large air-bubbles on the top of a fine blue colour, but only a settled froth of small tarnished bubbles; and when, by dashing upon the surface of it with the rake, it makes a hissing noise produced by the breaking of a vast number of these small air-bubbles as soon as they are formed. The liquor has also an offensive smell like rotten eggs, and the sediment does not change colour when taken out of the liquor. This accident will very probably take place, if you do not carefully attend to the smell of the vat, but imprudently put in the stuffs when the pastel has spent the lime; for in that case the small quantity of lime which remains will adhere to the stuffs, and will thus give them a bad colour. When this is perceived, you must immediately take them out, and add three or four handfuls of lime in proportion to what you suppose the vat has suffered, but without stirring it up from the bottom. On stirring the vat you ought to attend to the noise as well as to the smell; for if the hissing ceases, and the bad smell is also removed, there are great hopes that the liquor only has suffered, and that the pastel is not impoverished. But when the liquor smells of lime, and is soft to the feel, the vat is then to be covered, and allowed to settle for an hour and an half; after which period, if the efflorescence commences, a pattern is to be put in, and the subsequent process is to be regulated by the colour it assumes.

Some are of opinion that the pastel blue is much superior

superior to that obtained with a mixture of indigo; but it is undoubtedly much dearer, as yielding a much smaller quantity of colour: and from the experiments of M. du Fay, as well as of our author on this subject, it appears that the prejudice in favour of pastel is by no means well founded. When a vat has been heated and well worked two or three times, the same colour is frequently preserved, only taking out part of the sediment, and supplying it with fresh pastel; but for this no directions can be given, as it is evident that the whole must be regulated by the practice of the dyer. Some are accustomed to allow the same liquor to remain for years in their vats, only supplying it with ingredients from time to time; but this practice seems not to meet our author's approbation, who thinks it rational to suppose that the best colours will be made by emptying the vats entirely when they have been heated six or seven times, and cease to give any more colour.

22
Danger of reheating a pastel vat when the lime is exhausted.

With regard to the reheating of the pastel vats, our author further observes, that if you heat a vat when it is exhausted, viz. when deficient in lime, it will imperceptibly turn in such a manner as to be in danger of being spoiled; because the lime, already too much diminished, will be entirely consumed by the heat. The only remedy, if discovered in time, is to throw it back into the vat, to supply it with lime, and then wait till it recovers before you reheat. In this operation also care should be taken to put the grounds into the copper with the liquor; and it must not be allowed to boil, otherwise some of the more volatile parts necessary for producing a good colour will be evaporated. Some do not put the indigo into the vat until some hours after the liquor has been emptied out of the copper, and the mixture begins to recover itself. This precaution is taken lest the vat should not recover, and then the indigo would be lost. An inconvenience, however, arises from this practice, viz. that the indigo does not give out its colour freely; so that it is best to put it into the vat immediately with the liquor, and to stir it well afterwards. If a vat that has not been worked is to be reheated, it must not be skimmed as in the common operations of this kind, for then the indigo would be skimmed off; but in ordinary cases the scum is composed of the earthy particles of the indigo and pastel, with a small quantity of lime. When too much lime is added, you must wait till it be consumed. It might indeed be corrected by an addition of acid or other ingredients; but as these also consume the colour, it is better to wait the natural operation of the lime itself. Weak lime proves likewise disadvantageous, because it remains in the liquor without incorporating with the paste. When this is the case, the paste smells strong, and the liquor has a kind of sweetish smell; but both ought to be alike in this respect. The remedy is to hasten the solution by stirring it often in order to mix the lime with the paste, till the proper smell of the vat be restored, and the froth on the surface becomes blue.

23
To slack lime for the purposes of dyeing.

To slack the lime for the purpose of dyeing, several pieces are to be thrown into water one after another, taking out each piece when it begins to ferment, and putting in another. It is then put into an empty copper or other vessel; and when fallen thoroughly

into powder, it is to be sifted through a fine sieve, and kept in a very dry cask.

In this operation acid waters are sometimes necessary; the method of preparing which is as follows: Fill a copper of any size with river water; put fire under it; and when it boils, throw it into a cask in which you had before put a sufficient quantity of bran. It should be well stirred three or four times a-day. Three bushels of bran into a vessel containing about 70 gallons of water have been found to answer the purpose. This water, at the end of four or five days, becomes acid; and therefore may be applied in all cases where it does not injure the preparation of the worsted. It must be observed, however, that woollen fleece, by too great a quantity of acid liquor, would be rendered difficult to spin, as being in a manner glued together by the matter proceeding from the bran. It is also necessary to take notice, that the acid must not be left in the cauldron, especially if this is made of copper; because it will corrode enough of the metal to occasion a deficiency in the colour. This metal, when dissolved, gives a greenish colour.

24
Preparation of acid waters.

The Dutch vats are constructed in such a manner as to require less frequent heating than those above described. The upper part of them for three feet downward is of copper, and they are almost surrounded by a brick wall at about the distance of six or seven inches from the metal. A quantity of hot embers are deposited in this interval, which maintain the heat of the vat so effectually, that it remains for several days in a state fit for working even after it becomes very weak. This is not the case with the others, which frequently give a much deeper colour than was intended, unless you suffer them to grow considerably colder; and in that case the colour is less bright.

25
Construction of Dutch vats.

The woad-vat differs from that already described only in being weaker and yielding less colour; but it is prepared in the same manner. The following is a description of the woad vat, according to an experiment made by M. Hellot, similar to that concerning the pastel already mentioned.

26
Of the woad-vat.

"I placed (says he) in a cauldron a small cask containing about twelve gallons, two-thirds full of river-water, an ounce of madder, and a small quantity of weld; at the same time I put into the cask a good handful of bran and five pounds of woad. At five o'clock in the evening the vat was well stirred and covered. It was again stirred at seven, at nine, at twelve, at two, and at four. The woad was then working, as has been already observed with regard to the pastel. Some air bubbles began to rise pretty large, but in a small quantity, and of a very faint colour. It was then garnished with two ounces of lime, and stirred. At five o'clock I put in a pattern which I took out at six, and again stirred. This pattern had received some colour. At seven o'clock I put in another, and at eight stirred again. This pattern was tolerably bright: I then added an ounce of indigo; at nine o'clock another pattern; at ten stirred again, and put in an ounce of lime because it began to smell sweetish; at eleven another pattern, and at twelve stirred again. This process was continued till five o'clock. I then added three ounces of indigo. At six I tried another pattern, and at seven stirred again. It would have been now time to fill it, being in a proper state

B b for

for working, as the last pattern which had been taken out very green became a bright blue: but as I was very much fatigued, having sat up the whole night, I chose to defer it till the next day, in order to see its effect by day-light; and for this reason I added an ounce of lime, sufficient to sustain it till nine o'clock in the morning. Patterns were put in from time to time; and the last being very beautiful, I filled the vat with a liquor composed of water and a small handful of bran only. It was then stirred, and patterns tried every hour. Being in a proper state at five o'clock, it was immediately worked. It was then garnished with lime, and mixed, in order to preserve it till such time as it might be convenient to re-heat.

"Two months afterwards I prepared another woad vat without indigo, that I might be enabled to judge of the solidity of the dye; and was convinced, by experiment, that it was of equal goodness with the pastel. Hence the pastel is superior to the woad only because the latter yields less colour than the other.

27
M. Hel-
lot's re-
marks on
the prece-
ding opera-
tions.

"The little variations to be observed in the method of setting these different vats, sufficiently demonstrates that there are many circumstances in the several processes not absolutely necessary. In my opinion, the only matter of importance, and which demands attention, is to conduct the fermentation with caution, and to avoid supplying with lime till, from the indications I have described, it appears necessary. With regard to the indigo, whether it be added at twice or all at once, whether a little sooner or a little later, is, I think, of very little importance. The same may be said of the weld, which I used twice, and twice omitted; and likewise of the pearl-ash, a little of which I put into the small pastel vat, and omitted in that of the woad. In short, it appears to me very demonstrable, that the distribution of the lime either in the setting or reheating the vats requires most attention. It must also be observed, that in setting either a pastel or woad vat, it cannot be too frequently examined; because though some are too slow, which is attributed to the weakness of the pastel or woad, others become too soon ready for working. I have seen seventy pounds of pastel lost by this neglect. It was ready for working at eight o'clock, but for want of the workman's constant inspection, he did not discover it till two hours afterwards. The paste was then entirely risen to the surface of the liquor, which smelt very sour. It was now impossible to recover it; he was therefore obliged to throw it out immediately, or it would very soon become insupportably putrid and fetid.

"This difference in the vat may be also produced by the temperature of the air, as it cools much sooner in winter than in summer. It is therefore necessary to watch very attentively, though it is seldom fit for working in less than 14 or 15 hours.

28
Of the in-
digo vat.

"The indigo vat (says our author) is about five feet high, two feet in diameter, and grows narrower towards the bottom, being surrounded by a wall, and a vacancy left for the embers. In a vat of this size you may put from two to five or six pounds of indigo. In order to set a vat containing twenty gallons, you boil in a copper about fifteen gallons of river-water for half an hour, with two pounds of pot-ash, two ounces

of madder, and a handful of bran. The indigo is prepared mean while in the following manner:

"Take two pounds of indigo, and put it into a pail of cold water, in order to separate the solid from the volatile particles, which will immediately rise to the surface. The water is then poured off, and the remaining indigo pounded in an iron mortar; you then put a little hot water into the mortar, shaking it from side to side, and pouring into another vessel that which swims, and which is consequently the best bruised. In this manner you continue to pound what remains in the mortar, still adding fresh water, in order to make the finest part rise to the surface, and so on till all the indigo is reduced to a powder so fine as to rise in the water, which is all the preparation required. The liquor which had boiled in the copper, with the grounds of the madder and pot-ash, which probably fell to the bottom, is thrown into the high narrow vat; at the same time adding the pounded indigo. The whole is then well stirred with a rake, the vat covered, and the embers put round it. If this operation was begun in the afternoon, you must renew the hot embers in the evening, which should also be repeated both morning and evening the next day: the vat should be lightly stirred twice the second day. In order to maintain the heat of the vat, you renew the embers on the third day, stirring the vat twice. You then perceive, that a shining brassy scum, divided and interrupted in many places, begins to rise on the surface. By continuing the heat, on the fourth day the scum becomes more perfect and less broken. The froth that rises upon stirring is now blue, and the vat a deep green.

"When it becomes green in this manner, it is an indication that the vat should be filled. For this purpose you must prepare a fresh liquor, by putting five gallons of water into a copper, a pound of pot-ash, and half an ounce of madder. When this has boiled a quarter of an hour, you fill the vat. You then stir it; and if it produces much froth, it will be in a proper state for working the next day. This is sufficiently known by the quantity of froth, and by the brassy scaly crust that swims on the top of the liquor; also when, by blowing or stirring it with the hand, the liquor beneath is green, though the surface appears of a brown blue.

"This vat, of which I have just described the process, and the first I had set, was much longer in coming to a colour than the others, because the heat was too strong the second day; but for this accident, it would have been ready for working two days sooner. It was attended with no other bad consequence; and therefore, as soon as it was in a proper state for working, I dipped at several times 30 or 40 pounds of serge. As the liquor was by this means diminished and weakened, it was necessary in the afternoon to replenish with a fresh mixture, composed of a pound of pot-ash, half an ounce of madder, and a handful of bran. Having boiled this a quarter of an hour, it was put into the vat; which was then stirred, covered, and a few embers put round it. In this manner it may be kept for many days; but when you mean to work it, it should be stirred the preceding evening, and supplied with hot embers.

"When

"When you would reheat this kind of vat, and replenish it with indigo, you put into a copper two-thirds of the liquor, now no longer green, but of a brown blue and almost black. When it is ready to boil, the scum on the top should be taken off with a sieve; after which it should be suffered to boil, with the addition of two handfuls of bran, a quarter of a pound of madder, and two pounds of pot-ash. The embers are then taken from under the copper, and a little cold water thrown in to stop the boiling. It is then emptied into the vat, with the addition of a pound of indigo pulverized and dissolved in some of the liquor, as I have said above. The vat being then stirred, covered, and a few hot embers put round it, will be fit for working the next day.

"When an indigo vat has been reheated several times, it should be emptied out entirely and set anew, because the colour becomes dull: for though heated, and in a proper state for working, the green colour is not so beautiful as at the beginning.

"I have had several other vats set in the same manner, with a greater or less quantity of indigo; as from one to six pounds, proportionably increasing or diminishing the other ingredients; always, however, putting a pound of pot-ash to a pound of indigo. From other experiments which I have since made, I am convinced that this proportion was not absolutely necessary. I am also persuaded that there are many other methods for the preparation of the indigo vat equally effectual. I shall nevertheless make some observations concerning this vat.

"Of all those which I have had prepared in this manner, I failed but in one; which was occasioned by neglecting to put hot embers round it on the second day. I added some pulverized arsenic, but without any effect; it would never come to a colour. Red-hot bricks were also thrown into it at several times; the liquor at times became greenish, but never sufficiently. At length, after having to no purpose tried several other means without being able to discover why it did not succeed, and having reheated it several times, I had it thrown out at the fortnight's end.

"The several other accidents which I met with in the conduct of the indigo vat only retarded the success; so that this operation may be considered as very easy in comparison of the pastel or woad vat. I have indeed made several experiments on each of them, with an intent to shorten the time of the preparation; but for the most part not succeeding, or at least not better than by common practice, it is needless to describe them.

29
Differences
betwixt the
indigo and
pastel li-
quors.

"The liquor of the indigo vat is not in every respect like that of the pastel. Its surface is a brown blue, covered with coppery scales, and the liquor itself of a fine green. The stuff or woollen which it dyes is green when taken out, and becomes blue immediately afterwards. The same observation has been made with regard to the pastel vat, but it is very singular that the liquor of the latter is not green, though it produces the same effect upon woollen as the other. It is also necessary to observe, that when the liquor of the indigo vat is changed out of the vessel, and too long exposed to the air, it loses its green colour, and at the same time all its qualities;

so that, though it yields a blue colour, it is not permanent.

"There is likewise a cold preparation of an indigo vat ³⁰ Cold indigo with urine, and it is also worked cold. For this purpose, you take four pounds of indigo powdered, and put it into a gallon of vinegar, leaving it to digest over a slow fire for 24 hours. At the expiration of this time, if it be not perfectly dissolved, it is again pounded in a mortar with the liquor, adding now and then a little urine. You afterwards put into it half a pound of madder, mixing it well by stirring the whole with a stick. When this preparation is finished, you pour it into a cask containing 60 gallons of urine: it is of no consequence whether it be stale or fresh. You mix and stir the whole well together; and this should be repeated morning and evening during the space of eight days, or till the surface of the liquor becomes green when stirred, and produces froth like the common vats. It may be worked immediately without any other preparation than stirring it three or four hours before hand. This kind of vat is extremely convenient; because when it is once prepared, it remains so always till it is entirely exhausted, that is to say, till the indigo has yielded all its colour: hence it may be worked at all times, whereas a common vat must be prepared over night.

"According as you would have this vat more or less considerable, you augment or diminish the ingredients in proportion to your quantity of indigo: thus for every pound of indigo you always put a quart of vinegar, two ounces of madder, and fifteen gallons of urine. This vat is much sooner prepared in summer than in winter. If you would hasten it, you need only take a little of the liquor, heat it in a copper without suffering it to boil, and afterwards pour it into the vat. This operation is so very simple, that it is almost impossible it should fail.

"When the indigo is entirely exhausted, the vat may be renewed by dissolving some fresh indigo in vinegar; but you must add madder in proportion to the quantity of indigo, and then pour it into the vat, which should be stirred as at first morning and evening: it will be as good as if it were fresh. This, however, should not be repeated more than four or five times; because the grounds of the madder and indigo would tarnish the liquor, which would consequently render the colour less bright. I must however confess, that as I have not myself experienced this vat, I cannot answer for its success: but the following with urine, which I have seen prepared, dyes woollens a very permanent blue.

"A pound of indigo was first steeped in a gallon of ³¹ An hot vat with urine. urine for 24 hours; it was afterwards ground in a large iron mortar with the same urine. When by this means the urine became very blue, it was strained through a fine sieve into a small tub; but the indigo which remained in the sieve was beaten again in the mortar with another gallon of fresh urine, and this was repeated till all the indigo passed through the sieve with the urine. This operation, which continued two hours, being finished, about four o'clock in the evening 62 gallons of urine were put into a copper, which was made very hot, but without boiling; and the scum which rose on the surface of the urine was brushed off the copper with

with a besom. This was frequently repeated till nothing rose but a slight white scum. The urine being thus sufficiently purified and ready to boil, it was thrown into the wooden vat; the prepared indigo was then added, and the vat stirred with a rake, in order that the indigo should incorporate with the urine. Immediately afterwards a mixture, consisting of a gallon of urine, a pound of alum, and a pound of red tartar, was added to the vat; but these were first reduced to a fine powder. The urine was then poured out on it in the mortar, and mixed together till it ceased to ferment. It was then poured into the vat, well stirred, and covered. In this situation it was left all night. The next morning the liquor was very green. This showed that the vat was in a proper state, and that it might have been used; but it was suffered to remain without working, because all that had been hitherto done was only the first preparation of the vat, and the indigo which had been put into it was designed only to nourish and temper the urine. Hence the vat was suffered to rest two days in order to complete the preparation, but covered all the time to prevent it from cooling too fast. It was then managed as follows: A second pound of indigo was beaten with purified urine as above. About four o'clock in the afternoon the whole vat was emptied into the copper: it was then made very hot, but not boiled. It still produced a thick scum, which was taken off; and the liquor, being near boiling, was returned into the vat. The indigo was immediately added, bruised as above, with a pound of alum, a pound of tartar, and two quarts of urine, with the addition of another pound of madder: it was then stirred, close covered, and suffered to remain so all night. The next morning it was in very good order; the liquor being very hot, and of a beautiful green: hence it was evidently in a proper state for dyeing; which was executed in the following manner. The substance to be dyed was woollen fleece.

"This fleece had been well scoured with urine, well washed, and perfectly well drained. Being thus prepared, 30 pounds of it were put into the vat. It was then well opened with the hands, that it might be equally drenched; and after this it was suffered to remain an hour or two according to the degree of shade that was required. During this time the vat was kept close covered, in order to preserve the heat; for the hotter it is, the better it dyes: when it becomes cold, it ceases to act. When the wool was sufficiently blue, it was taken out in large balls, as big as a man's head; and at the same time squeezed and wrung over the vat, and immediately given to four or five women who stood round the vat, in order to open it, and expose it to the air between their hands till the green colour which it had coming out of the vat changed to blue. This change was produced in three or four minutes. These 30 pounds being thus dyed, the vat was raked, and then suffered to stand for two hours, keeping it always close covered. At the expiration of this time they put in another 30 pounds of wool, which was opened well with the hands. The vat was again covered; and in four or five hours this wool had taken as good a colour as the former: it was then taken out of the vat in balls in the same manner as the former. This operation being finished, the vat was still warm,

but not sufficiently so to dye any more wool; for when it has not a sufficient degree of heat, the colour which it yields will be neither uniform nor solid: hence it is necessary to reheat and replenish with indigo as before. This may be done as often as you think proper; because this vat never spoils by age, provided that while it is kept idle you give it a little air.

"About four o'clock in the afternoon all the liquor was emptied into the copper, with the addition of a sufficient quantity of urine to replace what had been evaporated and lost in the preceding work. This generally requires about eight or nine buckets of urine. The copper was then heated, the scum taken off as before: when ready to boil, it was returned into the wooden vat. You add to it a pound of indigo, pounded and mixed with urine as above, a pound of alum, a pound of tartar, a pound of madder, and two quarts of urine. After the vat is stirred and close covered, it is suffered to stand all night. It will be in a proper state the next day, and capable of dyeing 60 pounds of wool at twice, as above. In this manner, the reheatings should be always done the day before you want to dye, and may be repeated *ad infinitum*.

"It is necessary to observe, that the more indigo you put into the vat at once, the deeper the colour: thus, instead of one pound, you may add four, five, or six, without increasing the quantity of alum, tartar, or madder; but if the vat contains more than three hogheads, the quantity of the ingredients should be proportionably augmented. That which I have just mentioned contained only three hogheads, and was consequently too small to dye at one time a sufficient quantity of wool to make a piece of cloth, viz. 55 or 60 pounds. To do this properly, it should contain six hogheads, which would be attended with a double advantage. First, all the wool might be dyed in two or three hours; whereas, by twice dipping, it could not be finished in less than eight or ten. Secondly, at the expiration of the three hours, the vat would be still very warm; so that, after stirring and letting it settle for a couple of hours, the same wool may be dipped again. By this means the colour is heightened, almost as much more; because wool once dyed always takes a much better colour than new or white wool, though suffered to remain in the vat even for 20 hours.

"It is necessary to be very attentive in opening the dyed balls as soon as they are taken out of the vat, and exposing them to the air, in order to change them from green to blue, which should be done by many hands at the same time, that they may be equally affected by the air, else the blue colour will not be uniform.

"Some manufacturers pretend that cloth, the wool of which had been dyed in this urine vat, cannot be perfectly scoured by fulling even at twice; others affirm the contrary, and I believe they are right. Nevertheless, if the first be right, one would suppose that the animal oil of the urine was become resinous by drying on the wool, or that incorporating with the oil by which the wool had been moistened for its other preparations, it would be more likely to resist the fuller's earth and soap than simple oil by expression. To remedy this, it is only necessary to wash the wool

in running water after it has been dyed, expressed, and opened, ungreened, and again cold. Be this as it may, a pastel vat in a large dye-house is preferable to those kinds of indigo vats prepared with urine; because with a good woad vat and a dexterous woad-man, you expedite more work than could be accomplished with any other blue vat. In mentioning the several indigo vats in this treatise, my design is not so much to introduce them to great manufactories, as to assist those who work at small fabrics; to whom, I flatter myself, this treatise will be equally useful. I will even describe a cold vat for the dyers of small stuffs mixed with thread or cotton, which succeeds very well, but which would be of no use for woollens.

³³
Another
cold indigo
vat.

"In some places they make use of a cold indigo vat, differing from that already mentioned, which is more commodious, as it is much sooner ready, and has no bad smell. It is prepared in the following manner.

"Three pounds of indigo, well pulverized, is put into a glazed earthen vessel, and dissolved in three pints of soap-boiler's lixivium, which is a strong solution of fossile alkali with quicklime. I have made use of a solution of potashes, and succeeded very well. The solution of indigo is performed in about 24 hours, as may be easily discovered by its remaining suspended in the liquor, which is thereby thickened, and becomes like an extract. At the same time you put into another vessel three pounds of slacked lime sifted with six quarts of water. The whole should boil during a quarter of an hour, and when settled should be drained off clear. You afterwards dissolve in this lime-water three pounds of green copperas, suffering it to settle till the next day. You then put 75 gallons of water into a large deal cask, the only wood proper for the purpose; as any other, particularly oak, would blacken and tarnish the liquor. The two solutions, which had been prepared the night before, are then added, the vat stirred, and left to settle. I have seen it sometimes take the colour in two hours; but with this vat it was very different, not being ready till very late the next day. It produces a great quantity of froth; and the liquor takes a fine green colour, but a little yellowish, something like the green of the common vat.

"When the vat is almost exhausted, it is replenished and quickened without fresh indigo, by adding to it a small liquor, consisting of two pounds of green copperas dissolved in a sufficient quantity of lime-water. But when the colour of the indigo is quite exhausted, it should be replenished with fresh indigo dissolved in a lixivium, such as I have just described. It is natural to suppose, that the quantity of your other ingredients must be augmented or diminished in proportion to the indigo. Some dyers use a mixture of vinegar and water impregnated with rusty iron. They suppose that the colour is thereby rendered more solid; but I am convinced by experience that there is no necessity for it, and that the colour is as permanent as any of the other blues prepared as I have directed above.

"The first time I prepared this vat, I proceeded according to a receipt sent me from Rouen. The soap-boiler's lixivium was simply denominated *strong water*. I suspected this to proceed either from malice or mistake, nevertheless, as in matters of fact it is unjust

to condemn without examination, I tried the common aqua-fortis, which produced the following effect.

"I took half a pound of indigo, well powdered, and steeped it in half a pint of common aqua-fortis, made with vitriol and salt-petre: this produced a fermentation. In this situation I left it for 24 hours; and having, as in the preceding operation, dissolved a pound of copperas in some lime-water, I poured these two mixtures into a cask containing about 17 gallons of river water. I stirred it well, but there appeared nothing extraordinary the next day. I still continued to stir three times a-day for two days together, and then suffered it to rest for two days more, persuading myself that it was absolutely spoilt. At the expiration of these four days, the liquor became of a red colour, but clearer than the pastel vats. I stirred it once more, and let it stand six days longer: it had then a little froth, but very pale: six days afterwards the surface of the liquor became brown, and underneath a brown green. I stirred again, and fancied that the liquor underneath was still reddish, though the froth which it threw up was of a good colour; I therefore conceived hopes that it would do, and that I should be able to work it the next day.

³⁴
Effects of
aqua-fortis
upon indigo.

"At the expiration of sixteen hours I dipped some cotton, which took colour, but so very weak, that I was obliged to let it remain in the liquor several hours, till the blue became sufficiently deep. It then withstood the summer air and sun tolerably well for 12 days; nevertheless, I had the vat thrown out as useless, on account of its tedious operation. Doubtless it might have been recovered with lime, or some other alkali that would have absorbed the acid of the aqua-fortis, but it was not worth the pains. Besides, the answer which I received from the person who sent me the receipt from Rouen, contained an explanation with regard to the kind of aqua-fortis that should be used; from which I learnt that it should have been the soap-boiler's lixivium, which, instead of being acid, is one of the most caustic alkalies. In fact, by making use of this alkaline lixivium, the operation was attended with immediate success, and never failed me since.

"I tried several of these different vats in miniature, in cucurbits, put into a water or sand bath. These last are attended with no difficulty; it is only necessary to diminish the quantity of the liquor, and of every ingredient, in proportion to your vat, and it is scarce possible it should not succeed.

³⁵
Of dyeing
blue in
small quantities.

"Concerning that which I first described, and which is set hot, as it is attended with a little more difficulty, and several persons may wish to try this operation themselves, being rather curious, and requiring neither expence nor preparation in miniature; I will give the description of a process which succeeded extremely well, and which I purposely supplied with much more indigo than is generally done in the common method.

"I boiled two quarts of water with two drachms of madder, and four ounces of pearl-ashes. When it had boiled a quarter of an hour, I poured it into a cucurbite, containing about a gallon, which was previously heated with hot water, in which I had put a quarter of a handful of bran. The whole being well stirred with a deal spatula, I put my cucurbite into a very

moderate sand heat, sufficient only to keep it warm, or nearly of the same degree of heat requisite in a common indigo vat.

"I continued the sand heat all night and the next day, without perceiving any alteration. I stirred it only twice during the day with the spatula. The day following it produced an efflorescence, formed a coppery scum on the surface, and the liquor became a brown green. I then filled it with a mixture, composed of a quart of water, two ounces of pearl-ashes, and a little bran. It was well mixed, and then left to settle. It became perfectly well coloured, and the next day I dyed several bits of woollen stuffs. These vats are reheated and replenished with as much ease as a great one."

36
Method of
dyeing
wool or
woollen
stuffs in any
of these
vats.

"After having prepared the vats according to any of the methods above mentioned, the dyeing any kind of woollen stuff is exceedingly easy; no other preparation for the dye being requisite than simple immersion in warm water, wringing them, and then dipping them in the vat for a longer or shorter time according to the deepness of the colour you wish to impart. From time to time the stuff should be opened; that is, taken out and wrung over the vat, and exposing it for a minute or two to the air till it becomes blue; for it must be observed, that in all the solutions of indigo or other materials hitherto described, the blue colour is produced by exposure to the air alone, and the stuff is always taken out green, and will retain that colour if not exposed to the air. In dyeing blue, therefore, it is necessary to let the colour change in this manner before you immerse it a second time, that the shade may be the better distinguished; for dark blues require to be dipped several times, but it is dangerous to make this experiment with light blues. When a large quantity of wool is to be dyed, which cannot be put into the vat all at once, it very often happens that the quantity first put in will take up the deepest dye. To prevent this, some dilute their indigo-vat with a quantity of warm water; but M. Hellot disapproves of this, as being apt to produce a fading colour. The best method, he says, is to dip them when the vat is nearly exhausted; and for this purpose he recommends the pastel-vat rather than any other: and though the colours produced in this manner are less bright than the others, they may be sensibly enlivened by passing the stuffs through boiling water. This, he says, is proper for all blue colours; as it not only renders the dye more fixed and bright, but cleanses the stuffs from accidental impurities. After the work is taken out of the hot water, it is to be rinsed in a running stream. It will be still more proper to full a dark blue stuff well with soap and water, and afterwards to rinse it in running water; for the soap will be so far from injuring the colour, that it will thereby be rendered more bright and lively. Some dyers, in order to save the dearer ingredients of pastel or indigo, make use of logwood; but this is by no means allowable, as the colour, though rather brighter than that of indigo, is exceedingly perishable. In 1748, M. Macquer of the Royal Academy of Sciences discovered a method of dyeing silk and cloth with a preparation of Prussian blue, superior to all the blues hitherto discovered. This, however, has never yet come into practice, nor is it at all probable that the colour of this pigment

can ever be made to stand washing with soap. In all the methods in which we could try the experiment, it could not even bear washing with plain water. Indeed, when we consider the great volatility of the colouring matter of Prussian blue, that it can only be fixed by iron, and that any alkaline matter will instantly disengage it, and make it resume its former volatility, there can be but very little hope of overcoming the difficulties which attend the process.

Having been so particular with regard to the preparation of the materials and method of dyeing wool, we need say the less concerning the method of dyeing silk or cotton. The following composition is recommended by M. Macquer. "To eight pounds of the finest indigo add six of the best pearl-ash, from three to four ounces of madder for every pound of ashes, besides eight pounds of bran, washed in several waters to take out the flour. When washed, and most of the water squeezed out, it is placed alone at the bottom of the vat. The pearl ash and the madder are then mixed, bruising them thoroughly together, and then boiling them for a quarter of an hour in a copper containing two thirds of the vat; the liquor is then suffered to rest, and the door of the furnace shut.

"Two or three days previous to this, eight pounds of indigo are steeped in a bucket of warm water, washing it well, and even changing the water, which has a reddish cast. Some begin with boiling the indigo in a ley of one pound of pearl-ash with two buckets of water; after which they pound it while quite wet in a mortar; then while it is yet in a paste, they fill the mortar with hot liquor which has been boiled before; letting it stand to settle for a short time, and then pouring off the clear into a separate boiler or into the vat. The same quantity of the mixture is then poured on the indigo which remained in the mortar, bruising and mixing it well, and then as before pouring it off into the boiler; which operation is repeated till the whole of the indigo is thus dissolved in the liquor. That in the boiler is gradually poured into the vat upon the bran in the bottom, adding afterwards the remainder of the composition, grounds and all. After stirring and raking for some time, it is let stand, but without fire, till it becomes cool enough for the hand to bear. After this a little fire is to be put round the vat, only to preserve the same degree of heat; and this should be continued till the liquor becomes green, which is easily known by trying it with a little white silk. This shows that the vat is in a proper state; but in order to be ascertained of this, it will be necessary from time to time to stir it with a rake, when the brown and coppery scum which appears upon it after standing for a little time shows that it is in a proper state for working. Even in this case it is necessary to behave with the utmost caution, and to observe whether on blowing aside the coppery scum just mentioned a fresh one appears or not; for if it does not, it is a sign that the vat is not yet ready. If the scum appears, it must stand three or four hours, when a new composition is made to complete it. For this purpose as much water as is necessary to fill the vat is put into a copper, boiling it with two pounds of ashes and four ounces of madder as at first. This new liquor is poured into the vat, raked and mixed, and then left to stand for four hours, when it is ready for dyeing.

37

M. Mac-
quer's me-
thod of
dyeing silk
of a blue
colour.

The

The method of preparing silk for the blue dye is by boiling with soap, using 35 or 40 pounds of the latter to 100 of the former; but no impregnation with alum is required. Before dipping it in the vat, however, it should be washed from the soap; and to cleanse it more effectually, it ought to be twice beetled at the river, having been divided into hanks for the conveniency of wringing. After being dipped in the vat, it is to be wrung as hard as possible, and then opened out to the air, to give it the blue colour, as directed for wool; it should then be immediately washed in two waters, and well wrung out again. Lastly, it is to be dried as quickly as possible; cutting the thread which ties it, if the hanks are large, because if kept tied it frequently turns red under the thread.

Silk dyed as above directed is apt to take the blue very unequally, and will most certainly do so, if not washed and dried immediately after dyeing. Fine dry weather is always best for these operations; for should water accidentally fall upon it, it would be full of reddish spots. In moist weather, therefore, and during the winter, a room with a stove will be necessary. Different shades of blue are produced by dipping that first which is intended for the darkest colour.

38
Of dyeing
cotton or
linen blue.

The method of dyeing cotton or linen blue is so little different from that already described with regard to woollen or silk, that nothing farther needs be said concerning it; only the colour upon cotton is generally less bright. M. de Apligny indeed tells us, that he has discovered a method of dyeing cotton velvets of a most beautiful and durable blue: but as he does not choose to communicate it, nothing can be said on the subject. In the former edition of this work, a receipt was given for dyeing cotton of a very good blue colour, and which, as being instantaneously done, may occasionally be useful. The indigo is dissolved in a mixture of lime and potash (probably the pure caustic lixivium would answer fully as well); and after it is dissolved, some raisins beat into a pulp in a brass or marble mortar are to be added. This very soon produces a copper-coloured scum at top; and the cotton being now dipped into the liquor receives the colour in an instant. Linen may be dyed in the same manner.

39
Of dyeing
red colours.

The next of the primitive colours to be considered is red; of which there are many varieties: but the principal are scarlet, crimson, and madder red. The dyeing of these colours differs considerably from that of the blues, because they require a previous preparation in the stuffs to be dyed; and it is on this preparation that the goodness of the colour very often depends. These preparations are generally alum, tartar, aquafortis, aqua-regis, or solution of tin in these acids. Galls and alkaline salts are also sometimes added, tho' they do not of themselves contribute any thing to the colour.

40
Venetian
scarlet.

There are three kinds of scarlet, viz. that dyed with kermes, with cochineal, and with gum-lac. The first, called *Venetian scarlet*, is the least bright, but more permanent, and less apt to be spotted than the others; inasmuch that in some pieces of tapestry done with this at Bruxelles in Flanders, it has scarce lost any of its vivacity in 200 years. However, it is scarce ever used except for tapestry, and is dyed in the following manner, according to Mr Hellot.

“The wool should be first drenched; for which

purpose you put half a bushel of bran into a copper, with a quantity of water sufficient for 20 pounds of wool, which to the best of my knowledge is the usual batch for one dyeing. In this liquor it should boil for half an hour, stirring it from time to time; after which it is taken out and drained. I shall observe, once for all, that when you dye worsted, you put a rod through each skein, which commonly weighs about a pound, and which should be kept on the rod during the whole process, by which means the skein is prevented from tangling. It is also convenient for turning the skein, in order to dip each part, that the whole may be equally coloured; for which purpose, you raise it about half way out of the liquor; and holding the rod with one hand, you pull the skein with the other, so as to let the part which before was next the rod fall into the liquor. If the worsted should be too hot for the fingers, it may be done by means of another rod. The equality of the colour depends so entirely upon the frequency of this manœuvre, that it cannot be too strenuously urged. In order to drain them, you rest the ends of the rods just mentioned on two poles; which should be fixed in the wall over the copper.

“While the worsted is draining, after being thus drenched, you prepare a fresh liquor, viz. by throwing out what remained in the copper, and replenishing with fresh water; to this you add about a fifth part four water, four pounds of Roman alum grossly pounded, and two pounds of red tartar. As soon as it boils, the worsted on the rods should be immersed for two hours, almost continually moving the rods, one after another, as I have before directed.

“It is necessary to observe, that after the alum is put in, when the liquor is ready to boil, it will sometimes rise suddenly out of the copper, if you do not mind to check the boiling by throwing in cold water. If, when it is ready to boil, you put in the cold worsted quickly, it will have the same effect. It is also proper to observe, that when dyers work in the great, they should have their legs bare, that the hot liquor may not rest in the stockings. When the quantity of tartar is rather considerable, as in the present operation, the liquor does not rise so high; but when there is nothing besides the alum, sometimes, when it begins to boil, half of the liquor boils over, unless prevented by the above precautions.

“When the worsted has boiled in this liquor for two hours, drained, lightly squeezed, and put into a linen bag, it is deposited in a cool place for five or six days, and sometimes longer; this is called *leaving the worsted in the preparation*. This delay helps it to penetrate, and increases the action of the salts; for as a part of the liquor constantly evaporates, it is clear that what remains, being more impregnated with the saline particles, becomes more active, that is to say, provided there remains a sufficient degree of moisture; for the salts being once crystallized and dry, their power is destroyed.

“When the worsteds have remained in this state for five or six days, they are then in a proper condition for being dyed. A fresh liquor is then prepared, according to the quantity of the worsted; and when it grows warm, if you want a full scarlet, you throw into it 12 ounces of pounded kermes to every pound of worsted; but if the kermes be stale, it will require pound for pound.

pound. When the liquor begins to boil, the worsted should be put in, being still moist; but if it has been suffered to grow dry after boiling, it should be put into warm water, and well drained.

"Before you put the wool into the copper with the kermes, it were advisable to throw in a small handful of refuse wool, which, being boiled for a moment, imbibes a part of the blackness and dross of the kermes; so that the wool afterwards dyed takes a much more beautiful colour. You now dip the skeins on the rods in the same manner as in the preparation, continually stirring them, and giving them air, from time to time, one after another. In this manner they should be kept boiling for a full hour. They are then washed and drained.

"If you would reap any advantage from the dye still remaining in the liquor, you may dip a little prepared wool, which will take a colour in proportion to the goodness of the kermes, and to the quantity which had been put into the copper.

"If you mean to dye a number of shades, one darker than another, you require much less of the kermes; 7 or 8 pounds being sufficient for 20 pounds of prepared wool. You then dip the quantity of worsted intended for the lightest shade, leaving it in the copper no longer than necessary, in order to turn it, that it may imbibe the colour equally. It is then raised upon the pegs, and the next shade immediately put in, and suffered to remain for a longer time. You proceed in this manner to the last shade, which should also remain till it has acquired the colour you desire.

"You begin with the lightest colour, because if the wool was suffered to remain in the copper longer than necessary, it would be no loss, provided you reserve this batch for the darker shade: whereas, by beginning with the darkest, you would have no remedy in case of any accidental skip in the light shades. The same precaution is necessary in regular shades of all colours; but of the colour in question these are seldom made, because the dark shades are not much in use: and as the operation for all colours is the same, what I have said respecting this will answer for all the rest.

"When the wool has been dyed in this manner, and before it is carried to the river, you may swill it in warm water, with a small quantity of soap, well dissolved; this adds a brightness to the colour; but, at the same time, gives it a little of the rose, that is to say, a crimson tinct.

"In order to render this colour more bright and beautiful than common, I have tried a great number of experiments, but could not obtain a red equal to that produced by cochineal. Of all the liquors for the preparation of wool, that which succeeded the best was made according to the proportions I have mentioned. By changing the natural tinge of the kermes, by various kinds of ingredients, metallic solutions, &c. various colours may be obtained, which I shall presently mention.

"It is impossible to prescribe any proportions for an ell of stuff, considering the infinite variety of their breadth, and even of their thickness, and the quantity of wool in their fabrication; experience is the best guide. Nevertheless, if you chuse to be exact, the surest way is to weigh the stuff to be dyed, and to di-

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minish about one quarter of the colouring ingredients prescribed for worsteds; because the stuffs take internally less colour, as their texture, being closer, prevents it from penetrating; whereas the worsted or woollen fleece takes the colour internally as easily as on the exterior surface.

"The alum and tartar, used in the preparation for stuffs, should also be diminished in the same proportion; neither is it necessary to let the stuffs remain in the preparation as long as the worsted: they may be dyed even the day after they had been boiled.

"Woollen fleece dyed in the red of kermes, and to be afterwards incorporated in mixed cloth, or for the manufactory of thick cloths, will have a much finer effect than if dyed with madder.

"A mixture of half kermes and half madder, is called *scarlet in half-grain*. This mixture gives a colour extremely permanent; but not so lively, inclining rather to a blood colour. It is prepared and worked precisely in the same manner as if kermes alone were used; only that in the liquor they put but half this grain, the other half is supplied by madder. This is consequently much cheaper; and it frequently happens that the dyers who make it, render it much less beautiful than it might be, by diminishing the quantity of the kermes and increasing that of the madder.

"From the trials made on scarlet in grain, or scarlet of kermes, both by exposing it to the sun and by various liquors, it is proved that there does not exist a better nor a more lasting colour. It may for solidity be compared to the blues already mentioned. Nevertheless, the kermes is scarce ever used except at Venice; for since the fiery scarlets are become the taste, this colour is almost entirely exploded. It has, notwithstanding, many advantages over the other, as it neither blackens nor spots; so that should the stuff get greased, the spot may be taken out without impairing the colour. Nevertheless, kermes is so little known to the dyers, that when I wanted a certain quantity for the above experiments, I was obliged to have it from Languedoc; the merchants of Paris encumber themselves with no more than what they vend for the use of medicine."

The second kind of scarlet, viz. that dyed with cochineal, is much more expensive and less permanent than the other. For inferior uses, such as tapestry, the colour is sometimes partly done with Brasil wood; but this colour cannot be made equally permanent with cochineal: and it is remarkable, that in whatever manner these fugitive colours be mixed with permanent ones, the latter never convey to them any portion of their durability, but, on the contrary, both go off together. The true cochineal scarlet is very difficult to dye in perfection, and almost every dyer has a receipt of his own for the purpose. The success of the whole operation, however, according to Mr Hellot, depends upon the choice of the cochineal, the water used for dyeing, and the method of preparing the solution of tin, which is now universally known to be the only ingredient by which a scarlet colour can certainly be produced. The following is his receipt for the preparation of this liquid, which from his own experience he gives as the best. To eight ounces of spirit of nitre add as much river water, dissolve in the mixture gradually half an ounce of very white sal-ammoniac,

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In order to make an aqua regis, to which add two drachms of purified salt-petre. This last ingredient, he owns, might be omitted; but he is persuaded that the use of it contributes to make the colour more uniform. In the liquor thus prepared dissolve an ounce of English tin reduced into grains by dropping it, when melted, into a basin of cold water. These are to be dropped into the liquor one by one, waiting for the dissolution of the first before we add a second, in order to preserve a quantity of red vapours, which are the phlogisticated nitrous acid; and to the mixture of which he supposes the beauty of the colour is partly owing. The solution prepared in this manner is of the colour of solution of gold; and if fine tin be made use of, there is neither black dust nor sediment of any kind to be seen in it; but though transparent when just made, it is apt to become milky with the heats of summer; which, however, is no detriment to it in our author's opinion: and it is certainly just, if the transparency returns with the coolness of the solution. The aquafortis or spirit of nitre used for this purpose ought to be such as will dissolve half its weight of silver: and by following this method you will always be certain of having a composition of an equal strength; so that any slight difference which may arise from the quality of the cochineal will scarce be perceived. A weak solution makes the scarlet incline towards crimson, and a strong one towards orange.

43
Preparation of
worsted
for the
scarlet dye.

When worsted is to be prepared for the scarlet dye, the following operation is necessary. For every pound of the stuff, ten gallons of clear river water are to be put into a small copper; and when it becomes pretty hot, two ounces of cream of tartar, and a drachm and an half of cochineal, both finely sifted, are to be added. A brisk fire is to be kept up; and when the liquor is ready to boil, two ounces of the composition already described must be added, by which the liquor is immediately changed from crimson to blood colour. As soon as it begins to boil, the worsted, previously steeped in hot water, and then expressed, is to be added. It must be suffered to boil for an hour and an half; after which it is taken out, gently squeezed, and washed in cold water, having taken care to stir it constantly all the time. It will now be a tolerable flesh colour, or even somewhat darker, according to the goodness of the cochineal and the strength of the solution of tin; but the colour will be so totally absorbed by the stuff, that the remaining liquid will be almost as colourless as water. This is called the *scarlet boiling*; and without this the dye would not hold. To finish the dye there must be another preparation of very clear water, the goodness of this being of the utmost consequence to the goodness of the colour. In this preparation, along with the other ingredients, there must be half an ounce of starch; and when the liquor is pretty hot, six drachms and an half of cochineal, likewise finely powdered, is to be added. A little before it boils, two ounces of the solution of tin are put in; by which, as in the former case, the colour is instantaneously changed. As soon as it begins to bubble, the worsted is to be dipped, allowed to boil an hour and an half, stirring it all the time, and then washing it as already directed. An ounce of cochineal will be sufficient to give a proper

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depth of colour to a pound of wool; a drachm or two more might be added, if you would have the colour very deep, but if it be much enlarged, the dye will turn out very dull.

In dyeing the scarlet colour, the material of which the cauldron is made is by no means a matter of small consequence. On this our author has the following observations. "Their cauldrons in Languedoc are made of fine tin. They are also used by several dyers at Paris; but Mr Julienne, whose scarlet is very highly esteemed, makes use of brass cauldrons. These are also used in the dyeing manufactory of St Dennis. Mr Julienne is careful only to suspend a large pack-thread net, with pretty small meshes, in his cauldron, to prevent the stuff from touching. At St Dennis, instead of a net, they use a large open wicker basket; but this is less convenient than the net, because it requires a man at each side of the copper to keep it even, and to prevent it, when loaded with the stuff, from rising to the surface of the liquor.

"This practice, so different with regard to the materials of the cauldron, determined me to make an experiment. I took two ells of white Sedan cloth, which I dyed in two cauldrons, one of copper, furnished with a pack-thread net, and another of tin. I weighed the cochineal, the composition, and other ingredients, with as much accuracy as possible. They boiled exactly the same time. In short, I was sufficiently attentive to make the operation the same in every particular; that in case of any perceptible difference it could only be attributed to the different materials of the cauldrons. At the first boiling, the two patterns were absolutely alike, except that the piece done in the tin cauldron was rather more marbled, and not quite so even as the other; but this in all probability might be occasioned by their not having been equally cleansed at the mill. I finished each piece in its proper cauldron, and they were both of them very beautiful. Nevertheless, it was very evident that the cloth which had been dyed in the tin was more fiery, and the other rather more crimsoned. They might have been easily brought to the same shade; but this was not my object. From this experiment, it appears that, with a copper cauldron, the quantity of the composition should be increased; but then the cloth grows harsh to the feel. Those who dye in copper, to prevent this evil add a little of the turmeric, which is a drug only used for false colours, and therefore prohibited by the regulations to dyers in grain, but which gives scarlet that dazzling fiery colour so much the fashion at present. It is, however, if you have any suspicion, easy to discover the deception, by cutting the pattern with a pair of scissors. If it has no turmeric, the cut edge will appear white, otherwise it will be yellow. When the close texture is equally dyed with the superficies, let the colour be what it will, they say the colour *cuts*, and the contrary when the middle of the texture remains white. Legitimate scarlet never cuts. I call it *legitimate*, and the other false, because that with the addition of the turmeric is more liable to fade. But as the taste for colours is so variable, as the bright scarlets are at present the mode, and as it is necessary, in order to please the buyer, that it should have a yellow cast, it were better to authorise the use of the turmeric, though

44
Proper material for the cauldron.

45
Experiment of M. Helot on this subject.

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a false colour, than to allow too large a quantity of the composition, by which the cloth is injured, being more liable not only to dirt, but also to tear, as the fibres of the wool are rendered brittle by the acid.

"I must also add, that a copper cauldron should be kept extremely clean. I have myself frequently failed in scarlet patterns by neglecting to clean the cauldron. I cannot in this place forbear condemning the practice even of some eminent dyers, who at about six o'clock in the evening make their preparation in a copper cauldron; and, in order to gain time, keep it hot till day-light the next morning, when they dip their stuffs. The preparation must undoubtedly corrode the copper during the night; and consequently, by introducing coppery particles into the cloth, injure the scarlet. They will tell us that they do not put in the composition till immediately before the cloth is dipped: but this is no apology; for the cream of tartar added on the preceding evening being sufficiently acid to corrode the copper, forms a verdigris which dissolves, it is true, as soon as it is formed, but which nevertheless produces the same effect.

46
How to
preserve a
tin caul-
dron from
melting.

"As tin is absolutely necessary in the scarlet dye, it were much better to have a cauldron of this metal, which would infallibly contribute to the beauty of the colour. But the price of these cauldrons, if sufficiently large, is an object of consideration, especially as they may melt in the first operation if not carefully attended to by the workmen. Besides, it would be very difficult to cast a vessel of so large a size without flaws that would require to be filled. It is absolutely necessary that they be made of block tin. If the flaws should be filled with folder, which contains a mixture of lead, many parts of the cauldron will retain the lead, which being corroded by the acid composition will tarnish the scarlet. Hence there are inconveniences in every particular: nevertheless, if it were possible to procure a skilful workman capable of casting a cauldron of the Melac tin without flaw, it were certainly preferable to every other; for though the acid of the composition should in some parts corrode it, the detached particles will do no harm, as I have already observed.

"There is no danger of melting a tin cauldron, but when it is emptied in order to fill it with a fresh liquor. I shall therefore add the precautions necessary to prevent this evil. In the first place, the fire should be taken entirely from the furnace, and the remaining embers quenched with water. Part of the liquor should then be taken out with a bucket, while the remainder should be dashed about with a shovel by another person, in order to keep the upper part of the cauldron continually moist, at the same time cooling what remains in the cauldron with cold water. In this manner it should be continued till you can touch the bottom without being burnt. It should then be entirely emptied, and all the sediment taken up with a moist sponge. This attention will preserve your cauldron.

47
Why wool
in fleece is
never dyed
scarlet.

"Woollens are never dyed scarlet in the fleece, for the two following reasons: The first is, or ought, to regard all stuffs of simply one colour; those of many colours are called *mixed stuffs*. These kind of stuffs are never dyed in the wool, especially when the colours are bright and fine; because, in the course of the fabrica-

tion, the spinning, twisting, or weaving, it would be almost impossible to prevent some white or other coloured wool from mixing, which though ever so trifling would injure the stuff. For which reason, reds, blues, yellows, greens, or any of those unmixed colours, should not be dyed till after they have been manufactured. The second reason is peculiar to scarlet, or rather to the cochineal, which being heightened by an acid, cannot stand the fulling without losing much of its colour, or being at least excessively crimsoned. For the soap which contains an alkaline salt destroys the vivacity produced by the acids. Hence it is evident that neither cloth nor stuffs should be dyed scarlet till they have been fulled and dressed.

"To dye different pieces of cloth at the same time, the directions already given do not entirely answer.

"For example, in order to dye five pieces of Car-⁴⁸ Directions for dyeing different pieces of cloth at the same time.
cassionne cloth at the same time, each piece five quarters broad, and fifteen or sixteen ells in length, it is necessary to observe the following proportions: You begin by making the composition in a very different manner from the preceding process, viz. twelve pounds of aquafortis put into a stone jar or glazed vessel, with twenty-four pounds of water, and one pound and an half of tin grains added. The solution goes on more or less slow according to the acidity of the aquafortis, and should stand for twelve hours at least. During this time a kind of blackish dirt falls to the bottom; the top should be then drained off the sediment: this liquor is of a clear lemon colour, and is preserved by itself. This process evidently differs from the first by the quantity of water mixed with the aquafortis, and by the small portion of tin, of which scarce any remains in the liquor; for the aquafortis not being in itself a solvent for tin, only corrodes and reduces it to a calx, provided neither saltpetre nor sal ammoniac be added, which would convert it into an aqua regia. The effect of this composition is not, however, different from others, and is perceptible to those who from experience are competent judges of this colour. The composition without sal ammoniac has been for a long time used by the manufacturers of Carcassonne, who doubtless imagined that its effect was owing to a supposed sulphur of tin, and may be preserved from putrefaction for thirty hours in winter and only twenty-four in summer. It then grows turbid, forms a cloud, which falls to the bottom of the vessel in a white sediment. This sediment is a small portion of the tin, which was suspended in an acid not prepared for the solution. The composition, which ought to be yellow, becomes clear as water; and if employed in this state never succeeds, but produces the same effect as if it had been milky.

"When the composition is prepared, as I have now described, according to M. de Fondieres, you put, for the quantity of cloth last mentioned, about sixty cubic feet of water into a large copper; when the water grows warm, you add a sackful of bran: it is sometimes necessary to use four water; they will either of them do, as they say, to correct the water, viz. to absorb the terreous and alkaline substances, which crimson the tinge of the cochineal. We should be well informed concerning the nature of the water employed, in order to know whether these correctives be necessary.

Be

"Be it as it may, when the water is a little more than warm, you add ten pounds of crystals or cream of tartar pulverised, that is to say, two pounds to each piece of cloth. The liquor should be then violently stirred; and, when rather hot, you should put into it half a pound of the powder of cochineal, mixing it well together, and immediately afterwards you pour into it twenty-seven pounds of the composition, very clear, which also requires to be well stirred. As soon as it begins to boil, the cloth being immersed, should boil very fast for two hours, and during that time should be kept in continued motion on the wynch, and when taken out passing it through the hands by the lifting, in order to open and give it air. It is afterwards carried to the river and well washed.

49
Method of
stirring the
cloth.

"In order perfectly to understand the method of stirring the cloth, it is requisite to observe, that a kind of reel or wynch, with a handle for turning, should be placed horizontally on the iron hooks which are fixed in the felloes that support the edge of the cauldron. You first join the several ends of each piece of stuff to be dyed at the same time; and as soon as they are immersed, you carefully keep the end of the first piece in your hand; you then lay it on the reel, which should be turned till the end of the last piece appears. It is then turned the contrary way, and in this manner every piece will be dyed as even as possible.

"When the cloth has been well washed, the cauldron should be emptied, fresh liquor prepared, to which you must add, if necessary, a sack of bran or some four water; but if the quality of the water be very good, there is no occasion for any addition. When the liquor is ready to boil, you put in eight pounds and a quarter of cochineal pulverised and sifted. The whole is then mixed together as even as possible; but when you cease to stir, you must mind when the cochineal rises to the surface, forming a kind of scum of the colour of lees of wine. As soon as this scum begins to divide, you pour in eighteen or twenty pounds of the composition. You should have a vessel full of cold water near the cauldron ready to throw in, lest after putting in the composition it should rise above the edge, as is sometimes the case.

"When the composition is put into the copper, and the whole well mixed, you turn the wynch quick for two or three turns, that every piece may imbibe the cochineal equally. It is then turned more slowly, in order to let the water boil. It should boil very fast for two hours, constantly turning and keeping the cloth down with a stick. The cloth is then taken out, and passed through the hands by the lifting, in order to give it air and to cool it; it is afterwards washed at the river, dried, and dressed.

"There is a considerable advantage in having a great quantity of stuff to dye at the same time; as for example, when the five first pieces are finished there remains a certain quantity of the cochineal, which, supposing seven pounds at first, might amount to twelve ounces; so that cloth put into this second liquor will imbibe the same shade of rose-colour as if you had coloured a fresh liquor with twelve ounces of cochineal. The quantity remaining may, however, vary very much according to the quality of the cochineal, or according to the fineness of the powder. Though the quantity of colour remaining in the liquor may be very in-

considerable, it nevertheless deserves attention on account of the dearth of this drug. Of this liquor, therefore, a preparation may be made for five pieces of cloth; and it will require less of the cochineal and less of the composition, in proportion, as near as you can guess, to the quantity remaining in the liquor. This is also a saving of fuel and time; but it is impossible to give positive directions concerning this manœuvre, which must be left to the ingenuity of the dyer; for having dyed rose-colour after the scarlet, you may make a third preparation, which will dye a flesh-colour. If there is not time to make these two or three preparations in 24 hours, the liquor spoils: some dyers put Roman alum into the liquor to prevent it from spoiling; but this changes it to a crimson.

50
Scarlets
crimsoned
by alum.

"Scarlets thus crimsoned in the same liquor in which they had been dyed, are never so bright as those done in a fresh liquor. Drugs which reciprocally destroy each other's effect are more efficacious when employed in succession.

"When you dye cloth of different qualities, or any kind of stuffs, the best method is to weigh them, and for every hundred pound to allow about six pounds of crystals or cream of tartar, eighteen pounds of the composition in the preparation, the same quantity in the completion, and in each of them six pounds and a quarter of cochineal. For the accommodation of those who would make small experiments, the whole may be reduced, viz. one ounce of cream of tartar, six ounces of the composition, and an ounce of cochineal for every pound of stuff. Some of the Paris dyers succeed very well by putting two-thirds of the composition and a quarter of the cochineal in the preparation, and the remaining third of the composition, and the other three-quarters of the cochineal, to the completion.

"It is not the custom to put crystal of tartars in the finish: I am however convinced by experience that it does no harm, provided that at most you put but half the weight of the cochineal; and in my opinion it made the colour rather more permanent. There have been dyers who have dyed scarlet at three times: in this case they had two preparations, and afterwards the finish; but they always used the same quantity of drugs."

We have already observed, that the kermes were so little used for brown or Venetian scarlets, that these kind of colours were made with cochineal. For this purpose the preparation is made as usual; and for the dyeing they add to the liquor eight pounds of alum to every hundred weight of stuff. This alum is dissolved in a separate cauldron with a sufficient quantity of water: it is thrown into the liquor before the cochineal. The remainder is done precisely the same as in common scarlet: it gives the cloth the colour of Venetian scarlet; but it is not by any means so permanent as the colour obtained from kermes.

There are no alkaline salts that do not crimson scarlet; but it is more generally the custom to use alum, because these alkaline salts are no addition to the permanency of the colour, and may possibly injure the stuffs, because all animal substances are dissolved by fixed alkalies. The alum, by being deprived of its phlegm by calcination, will more certainly crimson. The liquor which had been used for crimsoning is red,

and still redder in proportion as the scarlet is more crimsoned, so that the colours part with much of their basis in the liquor by which they are darkened. It is, however, impossible to darken in grain without salts. The late Mr Barron, in a memoir which he presented to the Royal Academy of Sciences 12 or 15 years ago, remarks, that he succeeded better with the salt of urine, than with any other salt, for uniting the colour and preserving its brightness and fulness; but, as he observed, it is very inconvenient to make any quantity of this salt.

51
Quality of
the water
used in
scarlet of
great im-
portance.

It has been observed, that the choice of the water for dyeing scarlet was of importance; the greatest part of the common waters sadden, because they almost always contain a quantity of stony or calcareous earth, and sometimes of sulphureous or vitriolic acid. These are commonly called hard waters; by this term they mean water that will not dissolve soap, and in which it is not easy to dress vegetables. By absorbing or precipitating these heterogeneous substances, all waters are rendered equally good. If the matter be alkaline, a little four water will produce this effect. Five or six cubic feet of this four water, added to 60 or 70 cubic feet of other water before it has boiled, will cause the alkaline earth to rise in a scum which may be easily taken off the liquor. A sackful of any kind of white mucilaginous root cut in small bits, or, if dry, powdered, will also, if the sack be left to soak in the water for a half or three-quarters of an hour, correct a doubtful water; bran, as we have said above, will also answer the same end tolerably well.

52
Of gum-lac
scarlet.

The scarlet produced by gum-lac, though less bright than cochineal, has the advantage of being more permanent. The lac most esteemed for dyeing is of a branched form. The colour is that of an animal, like that of cochineal and kermes, and the branched kind has most of the animal particles in it. The best kind is of a blackish brown colour on the outside, and red within; and from some experiments made by M. Geoffroy, it appears to be a kind of comb, somewhat resembling that made by bees or other insects of that kind. Dyers sometimes use it when pulverised, and tied up in a bag; but to this M. Hellot objects, because some of the gum-resin being melted by the heat of the boiling liquid, escapes through the cloth, and adheres to it so closely, that it must be scraped off with a knife when cold. Others endeavour to extract the colour by boiling it in water after it has been reduced to powder, and then letting it stand to settle, and pouring off the coloured liquid; but in this way it often turns putrid. M. Hellot, therefore, after several unsuccessful trials

53
M. Hellot's
method of
extracting
the colour
of gum-lac.

to extract all the colour readily, had recourse at last to mucilaginous roots; which, without communicating any colour of their own, retained that of the lac so effectually as to remain with it upon the filtre. Comfrey-root was that with which he succeeded best. For extracting the colour, he used it dried and powdered, in the proportion of half a drachm. to a quart of water. In this it is to be boiled for a quarter of an hour; then strained through a linen cloth, and poured while quite hot upon the gum-lac powdered and sifted through an hair-sieve. By this it immediately acquires a fine crimson colour; after which the whole is set to digest in a moderate heat for twelve hours, stirring the gum which remains at the bottom seven or eight times. The

water thus impregnated with the colour is afterwards decanted into a vessel large enough to contain four times the quantity, which is then to be filled with cold water. A small quantity of strong solution of Roman alum is then added; the coloured mucilage subsides; and if any colour remains in the liquor, it may be precipitated by the addition of some more alum, until at last the water will be left entirely colourless. After the crimson mucilage is entirely sunk to the bottom, the clear water is drawn off with a syphon, and the remainder put upon a filtre, to let the liquid slowly drop off or evaporate. If the whole of the colour be not extracted from the lac by one operation, it is to be repeated till no more appears, and the residuum becomes of a pale straw-colour. The best lac, detached from its branches, does not yield more than one-fifth of its weight in colour; and hence there is no great advantage to be made by substituting it in place of cochineal for the scarlet dye.

For dyeing scarlet with this extract of gum-lac, the requisite quantity of it, dried and powdered, is to be put into an earthen or block-tin vessel. Some hot water is then to be poured upon it; and, when well moistened, add the proper quantity of the scarlet composition, stirring the mixture with a glass pestle. By this means the powder, which before was of a dark dirty purple, acquires an exceedingly bright scarlet. The solution in which the crystals of tartar had been previously dissolved is then to be poured into the liquor; and as soon as the latter begins to boil, the cloth is to be dipped into it, turning it over and over according to the common method. The remainder of the operation is to be performed in the same manner as if cochineal were used. The extract, in our author's opinion, afforded about a ninth part more colour than cochineal.

54
Method of
using the
extract of
gum-lac.

Crimson is the colour produced by cochineal with alum and tartar only, without any solution of tin. For this colour two ounces and an half of alum, with an ounce and an half of white tartar, are to be taken for every pound of wool. These being put into a cauldron with a proper quantity of water, are to be made to boil before the stuff is put in. As soon as the liquor begins to boil, the wool is to be put into the cauldron, and the boiling continued for two hours; after which it is to be taken out, gently squeezed, rinsed in water, and put into a bag, which is also necessary to be done with the preparations for every other colour. A fresh liquor must be prepared for the dye, in which an ounce of cochineal is to be put for every pound of wool. When it begins to boil, the wool is to be put in, and managed as already directed for scarlet. For the finest crimson, the stuff, after the common process is finished, should be dipped in a new liquor in which a small quantity of sal ammoniac is to be dissolved, and an equal quantity of potash added after it is pretty hot.

55
Of dyeing
crimson.

A very beautiful crimson is obtained by boiling the wool as for common scarlet, then making a second preparation with two ounces of alum, and an ounce of tartar to every pound of wool. It should remain an hour in this decoction. A fresh liquor is then to be prepared immediately; in which to every pound of wool you put six drachms of cochineal. When it has remained an hour in this liquor, it is taken out and immediately dipped in a solution of barilla and sal ammoniac;

moniac; and in this manner a great number of very beautiful shades of crimson may be prepared by diminishing the quantity of cochineal. In this process it is necessary that the mixture of alkaline salt and sal ammoniac should not be too hot, as this would cause the volatile spirit evaporate too quickly, and the crystals of tartar also, being neutralised, would lose their effect.

56
Of dyeing
silk of a
crimson
colour.

For dyeing silk of a fine crimson with cochineal, M. Macquer recommends only 20 pounds of soap to 100 of silk; "because (says he) the little natural yellow still remaining in the silk, after only this quantity of soap, is favourable to the colour.

"Having washed and beetled the silk at the river to discharge it well of the soap, it is put into a very strong solution of alum, where it should remain generally from night till the next morning, about seven or eight hours. The silk is then washed and twice beetled at the river; during which time the following liquor is thus prepared:

"You fill a long boiler about one-half or two-thirds full of river water; when this water boils, you throw in some white nutgalls pounded, letting it boil a little longer, about a quarter of an ounce to two ounces for every pound of silk. If the nutgalls are well pounded and sifted, they may be put in at the same time with the cochineal.

"The silk being washed, beetled, and distributed upon the rods, you throw into the liquor the cochineal, carefully pounded and sifted; it must be then well stirred with a stick, and afterwards boiled. You may put from two to three ounces for every pound of silk, according to the shade required. For the most common crimson colours two ounces and an half is sufficient, it being seldom necessary to use three ounces except for some particular match.

"When the cochineal has boiled, you add to the liquor for every pound of cochineal about an ounce of the solution of tin in aqua regia; it is called *composition*, and made in the following manner:

"One pound of the spirit of nitre, two ounces of sal ammoniac, and six ounces of fine tin in grains: the two last are put into an earthen pot of a proper size; twelve ounces of water is then poured on it, the spirit of nitre afterwards added, and the whole left to dissolve.

"This composition contains much more tin and sal ammoniac than is used for the scarlet of cochineal on wool; it is however absolutely necessary.

"This quantity of the composition should be well mixed and stirred in the liquor, and the copper then filled with cold water, about eight or ten quarts to every pound of fine silk; coarse silk requiring less, as it occupies less space. The liquor is then fit to receive the silk which is immersed, and returned till it appears uniform, generally requiring about five or six returns. The fire is then stirred; and whilst the liquor is boiling, which it should do for two hours, the silk is returned from time to time. The fire is then taken from under the copper, and the silk put to soak in the same manner as for aluming. It should remain for five or six hours, or even, if the liquor be ready at night, till the next morning. It is then taken out, washed at the river, twice beetled, wrung as usual, and put on the perches to dry.

"To sadden the grain of scarlets, the silk when taken out of the cochineal liquor is washed and twice beetled at the river; the water-liquor is then prepared, in summer as it is, but in winter a little warmed, adding a solution of copperas, more or less according to the darkness of the shade required. The silk should be returned in this liquor, in small hanks, till it becomes very even; and when the shade is equal to expectation, should be taken out, wrung and put to dry without washing if you like, because the copperas liquor is little more than clean water. The copperas gives the cochineal a violet tinct, depriving it of its yellow. If, however, it should appear to lose too much of its yellow, it may be preserved by adding to the copperas liquor a little of the decoction of fustic. Nothing but copperas will sadden grain scarlets; the logwood being quite useless for this purpose, copperas alone will suffice, as it darkens greatly with the nutgalls used in grain scarlets.

"The process just related for producing this colour is the most in use at present, as it gives a more beautiful shade than can be obtained by any other method. Nevertheless, as many dyers proceed in the old way, we shall describe it here.

"For these grain scarlets the round paste, as imported from the Indies, is added in the boiling of the silk. When the soap boils, about an ounce of rocou is bruised in the cullender, in the same manner as described for orange-colours. It should be pounded as fine as possible, lest any lumps should remain and stick to the silk.

"This small quantity of rocou, in the boiling of the silk, has the same effect as the composition, yellowing a little. The remainder of this process is just the same as the preceding; but without the addition of either composition or tartar.

"The silk dyers are accustomed to use only the finest cochineal, and even always prefer the prepared cochineal, which is cleansed from all its impurities, sifted and picked. This is certainly commendable, considering that the cochineal not prepared being less pure, the more of it must be added, and that the dregs remaining in the liquor may injure the colour. The white tartar used in grain scarlets serves to exalt and yellow the colour of the cochineal, producing this effect by its acidity, all acids having the same effect: we must, however, observe, that tartar is preferable, as it gives a more beautiful tinct. But, notwithstanding the quality of the tartar, it is still incapable of exalting the colour of the cochineal sufficiently to produce a grain scarlet, whatever quantity may be added if employed by itself: for if the dose of this ingredient be moderate, it will not yellow enough; and if too large, it destroys and degrades the colour, without any good effect. In order to assist the tartar, it will be necessary to add some of the composition, which, as we have seen, is nothing more than a solution of tin in aqua regia. This solution with cochineal, when used for dyeing of worsted, has a considerable effect, changing it from a crimson, its natural colour, to a prodigious bright fire colour; and produces only a crimson when applied to silk: but it gives this colour a very beautiful tinct; for uniting with the tartar, it augments the effect without impoverishing the colour, saving the rocou ground, as we have before observed.

"As

57
Use of nut-
galls in dye-
ing silk of a
crimson co-
lour.

"As to nutgalls, they produce no good effect with regard to colour: on the contrary, if you use too much, they tarnish to a degree, entirely spoiling the colour; nevertheless, it is always the custom to put the quantity we have specified.

"One might probably conjecture from the introduction of this practice, that scarlets were formerly produced with cochineal, without either tartar or composition, yellowing only with rocou: silk dyed in this manner, however, would have no rustling, so that it could not be distinguished from silk dyed with Brasil wood. Nutgalls, on account of their concealed acid, having the property of giving the silk a great rustling, are therefore added with cochineal; by which means these scarlets are distinguished by the feel from the scarlet of Brazil wood: for we must observe, that the Brasil dye cannot stand the action of the nutgalls, by which it is entirely destroyed.

"But besides giving this rustling to the silk, it has at the same time the singular and very remarkable quality of adding to its weight very considerably; so that by putting one ounce of nutgalls to every pound of silk, you add two or two and a half *per cent.* to the weight: by this means some silk-dyers add even seven or eight *per cent.* They are so much accustomed to this advantage in weight, owing to the nutgalls, that even when this drug becomes useless by the addition of the tartar and composition, which produces the same rustling, they make it still necessary on account of the weight, which is not proportionably increased by the other acids. White nutgalls are always preferable to the black, as they injure the colours much less. We may, however, hence conclude, that for grain scarlets nutgalls are not only useless but very prejudicial; and serving only as an imposition, is a blameable practice, and injurious to commerce.

"The silk is thus suffered to remain in the liquor, in order to make it wholly imbibe the cochineal. During this repose it takes a good half-shade; and the colour yellowing in proportion, gives it a much finer cast.

"One would be apt to believe, that leaving the silk to boil in the liquor for a longer time would have the same effect; but experience proves the contrary: besides, it would be more expensive, considering that it would be necessary to continue the fire.

"The cochineal leaves on the silk, when taken out of the liquor, a kind of scale, or rather the skin of the insect, which always contains a portion of the colouring juice. In order, therefore, to cleanse the silk perfectly from this kind of bran, it is twice beetled when washed at the river. By this means the colour becomes more brilliant, clearer, and fuller.

"The two beetlings before dyeing are necessary, because the silk having been strongly alumed for this colour, and intended to boil in the dyeing liquor for a great while, would, without this precaution, yield a certain quantity of the alum, which not only injures the colour, but likewise prevents the perfect extraction of the cochineal; for generally all neutral salts added to the dyeing liquor have more or less this inconvenience.

"The grain, or cochineal crimson, such as described, is not only a very beautiful, but may be considered as a most excellent colour: it is the most permanent

of all dyes for silk. It perfectly resists the boiling with soap, and evidently suffers no alteration from either the sun or the air. Silk stuffs of this colour, commonly used in furniture, are sooner worn out than faded. It is frequently seen that the colour of this grain crimson in furniture, though more than 60 years old, is scarce impaired. The only observable difference occasioned by time is, that by losing the yellow cast it becomes rather darker, approaching nearer to the violet."

58
Of dyeing
cotton of a
red colour.
The dyeing of cotton red is attended with much more difficulty than any of the substances hitherto mentioned; and indeed to produce a good scarlet or crimson upon it has hitherto been a desideratum in the art. The following are M. Apligny's directions for dyeing such reds as are commonly in use. "It is necessary, previous to the dyeing of cotton thread, to cleanse it from that unctuous matter by which the dye is prevented from penetrating its pores. For this purpose they make use of four water; which is prepared by throwing some handfuls of bran into hot water, and letting it stand 24 hours, or till the water becomes sour, when it is fit for use. These four waters, however, cleanse the cotton but very imperfectly, carrying off only the superficial part of the unctuous matter, which river water would do as well. The lixiviums of ashes are more effectual; and therefore all fixed alkalies, particularly kelp, or even the ashes of new wood, are, for the reason I have already given, generally preferred for this operation. The salts are extracted in the same manner as by the bleachers; and the cotton is then steeped in these lixiviums, which, like the silk, is inclosed in a clean linen pocket or sack, to prevent the skeins from tangling: it should boil for a couple of hours: when perfectly cleansed, the pockets sink to the bottom of the liquor, because the impeding matter being removed, the water penetrates the pores. The pocket is then taken out of the copper, the skeins separated from each other, and washed at the river. They are afterwards wrung on the peg, and again rinsed till the water comes off clear. The skeins are then spread on the perches to dry.

"To dye cotton red requires three preparations, viz. cleansing, galling, and aluming. The operation of cleansing as above.

"With regard to the galling, any kind of galls may be used in case of necessity; or even tan may be substituted; but that requiring more, it would not answer the purpose so well. The black Aleppo galls, because less suffices, are preferable to the white galls, which though cheaper make the expence come nearly equal. The Aleppo galls are, however, liable to dull the colour, which though easily revived, the white not producing this inconvenience, are generally preferred by most dyers. It requires nearly five quarts of liquor to drench one pound of cotton; so that for 20 pounds, five pounds of pounded galls are boiled in about 120 quarts of water; it should boil for two hours, or till by pressing it between the fingers it breaks easily.

This liquor is drawn off clear, and poured into a tub, into which, when cold, or even whilst warm, the cotton, which was before divided into hanks of about eight ounces each, and tied with a thread to prevent them from tangling, is dipped. Suppose, for example, that having about 40 of these hanks, and 100 quarts of the gall liquor, a part of it necessarily evaporating

rating in the boiling, five quarts of this liquor is taken out of the tub and put into a trough, into which you dip two skeins at once, carefully working them till they are soaked. They are then taken out and laid in an empty tub, pouring over them the remainder of the liquor in which they had been soaked: five quarts more are then taken out of the tub containing the gall water, poured into the trough, and two more hanks dipped into it, and so on successively till the whole is galled. The gall liquor should be stirred in the tub every time you take out, that the whole of the cotton may be galled equally, which it would not be were the grounds to settle at the bottom. This operation finished; if any of the liquor remains, it is poured on the galled cotton, being orderly ranged in the tub; where, after remaining 24 hours, it is taken out skein by skein, gently wrung, and then put to dry.

"The aluming for the cotton consists of about four ounces of Roman alum for every pound of the substance. Having pounded the proper quantity of alum, it is dissolved over the fire in a copper containing a sufficient quantity of water, taking care not to let it boil, otherwise it would lose its strength. The liquor is immediately poured into a tub or trough of cold water, proportioned to the quantity of the cotton, so as that the whole of the liquor may be as that of the galling, 100 quarts for every 20 pounds of cotton. It is the custom to add to this alum liquor a solution partly composed of arsenic and white tartar, with one part of the lixivium of kelp. The first solution consists of one grain of arsenic and two grains of white tartar, in two or three quarts of water. When the water in the copper boils, the arsenic and tartar, well pounded, is put into it, and kept boiling till the liquor is reduced to about half. When cold, it is strained and put into bottles or vessels, which should be stopped and kept for use.

"The kelp lixivium is made with about half a pound to a quart of water. You will know if this lixivium be sufficiently strong, when by putting an egg into it the point only appears on the surface.

"You then add to the alum liquor for this supposed 20 pounds of cotton 20 quarts of the solution, and three quarts of the said lixivium, observing nevertheless that the whole of the water used in mixing the alum and other substances be always in the proportion of five quarts of liquor to every pound of cotton. The 20 pounds of cotton are then plunged into this astringent pound by pound, in the same manner and with the same precaution as in galling; it is afterwards wrung, but without being too much squeezed, and then slowly dried.

"Some dyers never use the solution of tartar and arsenic with the alum, rationally supposing that these substances, as they rust and yellow the red colours, would be prejudicial to the dye: the red furnished by madder, being already too much inclined to this shade, requires rather to be faddened; and for this reason partly the kelp lixivium is added to the aluming. Several, therefore, use six quarts of this lixivium instead of three; and these six quarts containing the salts of about three pounds of kelp, which by supposing the kelp ashes to contain a quarter of its weight of salt, is in proportion of half an ounce to every quarter of a pound of alum.

"Instead of the solution of tartar and arsenic, others

make use of a solution of sugar of lead, prepared separately. It should be observed in this particular, that when the sugar of lead is dissolved in common water, it becomes turbid and whitish, because plain water not dissolving this perfectly, a kind of partial separation of the calx of lead takes place; but by mixing a sufficient quantity of distilled vinegar with the water, the calx entirely disappears and the solution is complete.

"When the cotton is taken out of the astringent, it is lightly wrung on the peg, and dried. The more slowly it dries, and the longer before it is maddered, the brighter the colour. Twenty pounds of cotton are generally dyed at the same time; but it were still more advantageous to dye only 10, because when there are too many hanks to work in the copper, it is very difficult to dye them equally, the hanks first immersed having time to take a great deal of colour before the last are put in; for as the first cannot be returned upside down till after the last are plunged, it is morally impossible that the dye should be even.

"The copper in which this ten pounds of cotton are dyed should contain about 240 quarts of water,—that is, 20 quarts of water for every pound of cotton; its shape should be an oblong square, and about two feet deep. It should also be wider at top than at bottom; the difference, however, should not be too great, because in that case the hanks laid slanting on the sides would be liable to spot. As several dyers have erred 59 for want of knowing how much water the copper should contain respecting its dimensions, and as the greater part of the brasiers are likewise ignorant in this particular, it may not be amiss, in this place, to add a short and easy method of finding the contents of a vessel. Ready method of finding the contents of a vessel.

"In the first place, suppose the vessel round or cylindrical, you begin by measuring the diameter; you then seek the circumference, afterwards the surface; and at last, by multiplying the surface by the perpendicular height, the product is the cube sought for, and determines the contents of the vessel.

"For example, a copper 22 inches deep by 30 diameter; to find the surface, take the proportion of the diameter to the circumference, which is as 7 to 22: state as in the Rule-of-Three, the first number 7, the second 22, and the third 30; the fourth number will be the circumference. This fourth number is found by multiplying the two middle numbers, 22 and 30, by each other, and dividing the product 660 by 7, the first number; the quotient 94 is the circumference sought for. If a square or oblong vessel, as in the present case, you have the circumference by adding the length of the four sides.

"Multiply afterwards the half of the circumference by the radius, that is 47 by 15, the product 705 is the number of square inches, and consequently the surface of your vessel.

"At last multiply 705 by 22, which is the perpendicular height, the product 15510 is the number of cubic inches your vessel contains. If it is larger at top than at bottom, it is necessary, in order to determine the circumference, to take a middle number between the breadth of the top and the breadth of the bottom, as if the copper be 33 inches at the top and at bottom 27, the middle number and real diameter is 30.

"Having multiplied the surface by the perpendicular height, you must reduce the inches to feet. Now the

the square foot being equal to 144 square inches, and the cubic foot to 1728 cubic inches; you must therefore in this example divide 15510 by 1728, the quotient $9\frac{1}{4}$ will be about the number of cubic feet in the copper; and as a cubic foot contains 35 quarts, consequently the copper contains 318 quarts Paris measure. (The Paris pint is our quart.) To madder 10 pounds of cotton, a copper containing 248 quarts of water is made hot. When it is rather too hot for the hand, six pounds and a quarter of good Dutch grape madder is put into it, and carefully opened and diffused in the liquor. When it is well mixed, the cotton, which had been previously passed on the rods and suspended on the edge of the cotton, is dipped into it hank by hank. When it is all dipped, the hanks on each rod are worked and successively turned upside down, beginning from the first that was put in, and so proceeding to the last; returning to the first, and thus continuing without intermission for three quarters of an hour, always maintaining an equal degree of heat, but without boiling. The cotton is then raised and drawn out upon the edge of the copper, and about a pint of the kelp lixivium poured into the liquor. The rods are then passed through the threads by which each hank is bound, and the cotton put back into the copper and boiled for about 12 or 15 minutes, keeping it entirely immersed during that time. It is at last raised, gently drained, wrung, washed at the river, and wrung a second time on the peg.

"Two days afterwards the cotton is a second time maddered, about eight ounces of madder to every pound; that is, five pounds of madder added to the dyeing liquor. The cotton is then worked in it in the same manner as in the first maddering, with this difference, that none of the lixivium is added, and that the liquor is made of well-water. This maddering being finished, and the cotton cooled, it is washed, wrung, and dried.

"To brighten this red, you put into a copper or trough a quantity of warm water sufficient to drench the cotton, pouring into it about a pint of the lixivium. In this liquor you immerse the cotton pound by pound; leaving it in for an instant only, when it is taken out, wrung, and dried.

"On this operation it ought to be observed, that the method of dyeing in two liquors has no advantage. For, besides that it consumes more time and wood, the second maddering cannot furnish much dye, considering that the astringent salts are exhausted by the boiling of the first maddering; consequently that the cotton, when deprived of these salts, cannot take the dye. I propose therefore another method now pursued with success by several dyers: it consists in giving the cotton two aluminings, and afterwards dyeing in one liquor only. By this means it takes the dye much better, and acquires more depth, because the whole of the madder turns to advantage. With respect to brightening, it is a needless operation for red cotton destined for the fabrication of callico; because the colour is brightened after it is woven, by dipping in warm water sharpened with a little of the lixivium. When the cotton is taken out of this water, if washed at the river and spread on the grass, the red brightens much better than by any other operation.

"The reds hitherto mentioned are vulgarly called
N^o 106.

madder reds, though those I am going to describe are equally obtained from a species of madder coming from the Levant. The latter, however, commonly called *lizary*, furnishes a dye incomparably finer than that produced by the best Zealand madder: it is, however, the fashion to call the red of madder the first dye, and the Adrianople red the second. The process of the latter I shall give in this place.

"When you have 100 pounds of cotton to dye, you put 150 pounds of Alicant soda, inclosed in clean linen, into a tub. This tub should be full of holes at the bottom, that the liquor may run into another tub underneath. The 150 pounds of soda being in the upper tub, is covered with 300 quarts of river-water, measured by wooden pails containing each 25 quarts. The water that passes from the first tub into the second is again poured over the soda at different times, till it has extracted all the salt. This lixivium may be tried with oil: if it uniformly whitens, and mixes well with the oil without any appearance of separation at the surface, it is then sufficiently saturated with the salt. It may be also tried with a fresh egg, as I have said above. You again pour 300 quarts of water over the soda contained in the superior tub, in order to extract the whole of the salt. Two similar lixiviums are afterwards made, each with the same quantity of water as had been used for the soda, viz. 150 pounds of fresh wood-ashes, and the other with 75 pounds of quicklime. These three lixiviums being clarified, 100 pounds of cotton are put into a tub, and watered with each of these lixiviums in equal proportion. When it has perfectly imbibed these salts, it is put into a copper full of water without being wrung, and boiled for three hours: it is afterwards taken out and washed in running water. This operation being finished, the cotton is dried in the air.

"A quantity of the above-mentioned lixiviums is then poured into a tub in equal portions, so as to make 400 quarts. In a part of this liquor, 25 pounds of sheep's dung, with some of the intestine liquor, is well diluted by means of a wooden pestle, and the whole strained through a hair-sieve. Twelve pounds and a half of good olive-oil poured into this mixture, when finished, instantly forms a soapy liquor. In this the cotton should be dipped, hank by hank, stirring every time, and with the same precautions I have already recommended in the aluming of cottons destined for the madder red. The cotton having remained 12 hours in this soapy water, is then taken out, lightly wrung and dried. This operation is repeated three times. The liquor that runs from the cotton when wrung falling again into the trough where the cotton was laid is called *fickiou*, and should be kept for brightening.

"When the cotton has been three times dipped in this soapy water, and afterwards dried, it is again dipped three times in another composition, made in the same manner as the first, with 400 quarts of lixivium and 12½ pounds of oil, but without the sheep's dung: the remainder of this liquor is also preserved for brightening. The cotton having been dipped in this liquor three times with the same precautions, and left in it the above-mentioned time, it is then carefully washed at the river to divest it entirely of the oil, without which the aluming would not take effect. Having been washed,

washed, it should be as white as if it had been bleached.

"When dry, you proceed in the aluming, which is done twice successively; but it is needless to give a detail of what has been sufficiently explained in the article upon madder red. It is enough in this place to say, that the galls, about a quarter of a pound to every pound of cotton, should be pulverized; that six ounces of alum should be put to the first aluming; for the second four ounces; and at last, that an equal quantity of the lixivium be added to the alum-water. We must also observe, that it were best to make an interval of three or four days between each aluming; and that no other astringent be added, all metallic salts being in general injurious to the beauty of the colour.

"Some days after the last aluming, you proceed to dyeing in the same manner as above, only using two pounds of lizary in powder for every pound of cotton; and, before you dye, adding to the liquor about 20 pounds of liquid sheep's blood. It should be well struck into the liquor, which should be carefully skimmed.

"In order to brighten the colour, the cotton is dipped in a lixivium of fresh wood ashes, dissolving in it five pounds of the best white Marseilles soap; the water should be warm before the soap is put into it. In this mixture the 100 pounds of dyed cotton is immersed, and worked till it becomes perfectly penetrated. Six hundred quarts of water are then put into another copper; and when warm, the cotton, without squeezing it out of the first, is put into the second, and boiled for three, four, five, or six hours, over a very slow fire, but as equal as possible, carefully covering the liquor to keep in the vapour, that none may escape but what passes through a funnel of small reeds.

"Some pieces of the cotton are taken out from time to time; and when sufficiently revived and washed thoroughly, the red is perfect. The cotton may be also brightened in the following manner: when washed and dried immediately after dyeing, it should be soaked in the sickiou for an hour, well squeezed, and also dried. When dry, you dissolve for every 100 pounds of cotton 5 pounds of soap in a quantity of water sufficient to cover the cotton. When the water is warm, the cotton is immersed; and having well imbibed, is put into a copper with 600 quarts of water. The whole is boiled very slowly during four or five hours, keeping the copper covered to prevent the steam from going off. This second method makes the red much brighter than the finest Adrianople carnation.

60
Difficulty
in produ-
cing a good
red by this
process.

"The process just described was practised at Darnetal, and in other manufactories of France, according to instructions communicated by a person who had seen this process in Turkey. But whether his observations were inaccurate, whether he concealed a part of the mystery, or whether the success of the operation depended on the concurring circumstances accompanying the various mixtures, I know not. Few, however, by closely observing this process, have hitherto obtained a red either so permanent or so beautiful as the red of Adrianople, and those who have succeeded think it but just to reap the advantage of their secret.

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On this subject, however, several not unuseful reflections may be advanced.

"First, the manner of purging the cotton indicates that this process is capable of damaging considerably, and of rendering the cotton very brittle, owing to the sharpness of the lixivium in which it is steeped, so burning in its nature as to make holes in the legs of the workmen who tread it with their feet. It is therefore more simple and less dangerous to cleanse the cotton in six quarts of lixivium to every pound of substance, and containing only six ounces of kelp for every six quarts; to boil the skeins in it afterwards, inclosed in clean linen pockets.

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Observa-
tions of M.
de Apligny
upon it.

"By this method the cotton would be sufficiently cleansed without being spoiled; the kelp may be even reduced to half the quantity, substituting in its place double its weight of fresh wood ashes, which would answer quite as well.

"Secondly, that the failure of many dyers is owing to their not sufficiently divesting the cotton of the oil, which prevents both the galling and aluming from taking effect. The mixture of the lixivium and oil not being well made, or the lixivium being too weak, the oil forms with it but an imperfect combination. This oil therefore, separating and swimming on the surface of the lixivium, sticks to the cotton, which it greases, and by obstructing the pores prevents the gall from penetrating. Great attention therefore should be given to the lixivium, in order to extract all the salt of the kelp, and to use quicklime, which is absolutely necessary to render this lixivium caustic; a quality without which the oil cannot possibly form a combination with the alkali, consequently can make no soap.

"In Europe the oil of olives is substituted instead of the oil of sesamum, which is used in the East-Indies and in Turkey; but the nature of these oils makes no difference in the operation. The oil of sesamum differs from the oil of olives only because it is thicker, consequently nearer to the nature of animal fat or wax; but the conclusion resulting from this difference is, that less of it may be required than of the oil of olives. Were the oil of sesamum absolutely necessary, it might have been easily procured. The sesamum is a species of fox-glove that grows in the Indies; but is cultivated in Italy, and especially in Sicily, where it is called *giurgulena*. The same kind of oil may be obtained from plants analogous; such as the gratiote, the henbane, &c. but the plant whose seed resembles it most is the convolvulus or lizeron.

"It is certain that the process brought from Adrianople might be greatly abridged; but we must leave the secret to those to whom it belongs: and I am besides convinced, that a memoir on this subject will be presented to the Academy of Sciences, and therefore will not anticipate.

"With regard to the sheep's dung and intestinal liquor, it is of no use in fixing the colour. But we know, that these substances contain a large quantity of volatile alkali quite developed, which has the property of rosing the red colours. If the bones of animals owe to their tenacious gluten the faculty of retaining so strongly the madder colour, the vivacity of this colour may be attributed, as from experience we

D d

learn,

learn, to their volatile alkali. It were absurd to imagine that the Europeans only had discovered this phenomenon; as it may be rationally supposed, that the Indians, having perceived it by accident, sought to imitate what chance had brought to their knowledge. It is certain, that in the red dye of the Maroquins, the process of which was brought from the Levant, they prepared the goat skins for dyeing with dog's excrement, having found it effective in exalting the dye of the lac.

"In the dyeing of cotton thread, it is common to mix the sheep's dung with a lixivium of fixed alkali; by which the volatile principle of the dung is retained, and consequently putrefaction prevented. By dipping the cotton several times in this soapy liquor, it is impregnated with the predominating alkaline principle; and we know by experience, that substances once impregnated with volatile alkali, for example, chemical vessels used in extracting it for a long time, retain a smell very like the smell of musk, even after having been well scrubbed with sand, ashes, soap, &c. Every time the cotton is dried when taken out of this liquor, the evaporation of the aqueous particles (the alkaline principles being changed into earth) produces a stronger adhesion in the pores of the cotton. From the union of this earth with a portion of the oil employed, a mastic is the result, which is afterwards completed by the alum; and this, in a word, is the theory of the fixity of this colour.

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Of the dye-
ing of li-
nen.

"Linen thread may be dyed in the same manner; only that, previous to its being purged like the cotton thread, it is usual to boil it in water, adding for every pound of thread a quarter of a pound of chopped sorrel. Oil of vitriol is, however, more convenient and better than sorrel. But I refer my reader to what I have already said upon the article of thread; observing only, that by this process the linen thread always takes less dye than the cotton, owing to the difference of their pores.

63
Method of
dyeing
crimson in
the Eastern
countries.

The following processes were taken from the manuscripts of M. Hellot. "According to the letters of M. Grange, correspondent of the Royal Society, who died at Schiras in Persia, June 1737, the dyers of the city of Damas dyed their crimson colour, so beautiful and so much esteemed in the east, in the following manner: Take ten *rottes* (a *rotte* weighs five pounds) of silk in skeins; wash it well in warm water; then let it soak in a sufficient quantity of hot water during half an hour; squeeze out the water; dip it afterwards, but once only, in a hot lixivium, made with a sufficient quantity of water, half a *rotte* of kelp ashes for every *rotte* of silk, which is immediately drained on rods, taking care not to leave the silk longer in the lixivium than is necessary for its being well soaked, lest the alkali should corrode it.

"Whilst the silk drains, they prepare another liquor cold, with ten ounces of the pulp of yellow melon, very ripe, which is uniformly diffused in a sufficient quantity of water. They steep in this liquor the ten *rottes* of silk for twenty-four hours; they increase or diminish the quantity of the above drugs in proportion to the quantity of the silk to be dyed. The silk, having remained one day in this melon liquor, is several times washed in fresh water till it becomes perfectly

clean; they then hang it to dry. Mean while the workmen fill a large pan of water, adding a half *rotte* of alum powdered for every *rotte* of silk. The pan is then suspended over a hot furnace, and the liquor boiled during twenty minutes; after which the fire is taken from the furnace. The silk is then dipped in this alum solution, moderately hot, and again taken out as soon as it is perfectly wet. They then put it into another pan, pouring over it the alum solution, in which it remains four or five hours, but no longer. It is then taken out and several times washed in fresh water.

"Whilst the silk is washing, a workman fills a large pan with water, adding an ounce of *baisonge* (a fungus), finely powdered, for every *rotte* of silk; when this new decoction has boiled for half an hour, they add ten ounces of *audex* (cochineal), very finely powdered, for every *rotte* of silk; that is, six pounds four ounces of cochineal for ten *rottes* of silk. As soon as this cochineal is added, the fire is taken from the furnace. The liquor is then gently stirred round with a stick; and when the mixture is perfectly made, they pour gently and by inclination a little fresh water into the middle of the pan. The water thus added not only cools the dye, but makes it much more lively. They then immediately dip the silk four or five times, wringing after every dip. This tincture is afterwards boiled again for about a quarter of an hour, and the fire is then taken from the furnace as before. When the liquor is a little cool they dip the silk, still observing to wring after every dip. This done, they put the silk into an empty kettle, pouring over it the remainder of the dye, in which it is left to soak for twenty-four hours. It is then well washed in clean water, dried in the shade, and when very dry wove into stuffs. This crimson is much superior to all the French and Italian crimsons; because the silk was never boiled in the dye.

"The dyers of Damas and Diarbequir say, that they could not accomplish this dye without the pulp of the yellow melon in the preparation, or without the *baisonge* used with the cochineal in the dye. According to M. Grainge, we have this melon in France; but he doubts concerning the *baisonge*, which is a species of fungus growing on trees in some parts of Persia, from whence it is brought to Damas, and might also be sent into France by the way of Aleppo, were we desirous of imitating this excellence in the crimson dye.

"To avoid mistakes in the quantity of the different ingredients employed in this process, it may be necessary to repeat, that a *rotte* of silk weighs five French pounds, and that the ten *rottes* of silk, produced as an example in this memoir, should also serve as a standard with regard to the quantities of the other ingredients.

"As to the water necessary for the preparation of the silk with the kelp, melon, and the alum for the dye, it requires no more than a sufficient quantity for wetting the silk, namely, about a finger's breadth over it, differing from the tincture, which as the skeins are dipped in this liquor at least ten or a dozen times, should be fuller in the kettle.

"The kali used in the preparation of the silk is nothing more than the ashes of a plant called by the Arabs

Arabs *kailou*. These are preferable to the ashes made from the *rouquet*, or those made in Egypt.

"The frames used for these silks are similar to the frames used at Lyons.

64
Genoese
method of
dyeing
crimson.

"At Genoa the silks designed for crimson are boiled in a much less quantity of soap than those intended for any other colour, 18 or 20 pounds serving for a hundred pounds of silk in the crimson dye; for any other colour, the Genoese use 40 or 50.

"When the silk is boiled, it is dipped in the alum liquor; and to a quantity of raw silk, weighing 72 pounds, they put from 16 to 18 pounds of roch alum, finely powdered, into a copper full of cold water. When the alum is perfectly dissolved, the silk is put to soak in it for near four hours: it may remain longer without any inconvenience, silk intended for crimson requiring more alum than for any other colour. When taken out of the alum liquor, it is shook and dressed on the pegs, but without wringing. One of the dyers being questioned why the silk was not wrung when taken out of the liquor? answered, that it would purge it too much from an impregnation so absolutely necessary for its taking the crimson dye.

"Of the 72 pounds of silk already mentioned, 32 pounds is *organzine*, and the remaining woof. At Genoa it is the custom to allow two ounces of cochineal to twelve of *organzine*, if designed for the warp of damask furniture, and for the same silk an ounce and three quarters of cochineal for 12 ounces of the woof, supposing it necessary to the beauty of the silk that the warp should be fuller than the woof; and to bring the colour of the damask to still more perfection, they add to the *organzine* a quarter of an ounce of cochineal, that is, instead of two ounces they add two ounces and a quarter, adding no more to the woof than one ounce and three quarters.

"As the above 32 pounds of *organzine* should be of the finest colour, they allow two ounces and a quarter of cochineal to every pound of silk; so that upon the whole they use 142 ounces of cochineal, or 11 pounds 10 ounces, Genoa weight; namely, 32 pounds of *organzine* to two ounces and a quarter of cochineal, making 72 ounces; 40 pounds of woof to one ounce and three quarters, making 70 ounces. Total, 142 ounces.

"In order to dye this 72 pounds of silk, alumed as above, they make use of an oval copper containing when full 200 quarts of water; they fill this copper two-thirds full of clean fountain water, adding afterwards the following drugs pounded and sifted. Two ounces of tartar, two ounces of *saffranum*, and two pounds and a half of the Levant galls.

"They wait till the drugs have boiled two minutes in this liquor; after which they add the 11 pounds 10 ounces of cochineal finely powdered and sifted; and whilst one of the workmen by degrees makes it sink to the bottom, another keeps violently stirring the liquor with a stick to promote the solution.

"This done, they fill the vessel with clean water to about a foot of the edge, immediately afterwards dipping the 32 pounds of *organzine*, divided on 14 rods. They let it remain till the vessel which they fill with clean water, and under which they put a large

fire, is ready to boil; they then, to make the silk take the colour more evenly, raise the rods without ceasing, one after another, that each may alternately reach the bottom of the copper, which being but two-thirds full, the upper part of the silk would else remain out of the liquor, the rods being supported on the edge of the copper.

"When the liquor was ready to boil, the forty pounds of woof, divided on 18 rods, were dipped; they still continuing to raise the rods, one after another, for half an hour, both the *organzine* and the woof, that each may alternately reach the bottom; so that when the workman came to the last he returned to the first, and so on successively.

"After the first half hour, they stopped for a quarter of an hour between every operation, the workmen still raising the rods from the first to the last, five or six times repeated in the space of an hour and an half; all the time keeping a good fire under the copper. The *organzine* was then steeped in this liquor two hours and a quarter, and the woof only two hours. The fire was then taken from under the copper; and the workman taking out one dip of the *organzine* and another of the woof, he wrung and dried them as much as he could to see if the colour was what he wished; if not sufficiently deep for the purpose, he let them both remain in the liquor something less than half an hour whilst the liquor was growing cold. He then took out all the silk, wrung it on the peg, then washed it several times in clean water, changing the water every time. This done he wrung it again on the pegs, and so finished the operation.

"It must be observed with regard to the *organzine* and woof, that though dyed in the same liquor, they were not however of the same shade at the conclusion of the operation; the *organzine* was deeper, having been a quarter of an hour longer in the cochineal liquor, during which time it was impregnated with the more subtle colouring particles of the cochineal.

"At Genoa it is not the custom to wash the silk out of the cochineal with soap water; on the contrary, they are persuaded that this practice dulls the brightness of the colour, and that the water, both for the cochineal liquor and for washing afterwards, should be the finest spring-water: for they remark, that the crimson dyed in summer with cistern water, is by no means so bright as the crimsons dyed at other seasons when the fountains are full.

"According to the dyers of Genoa, there is a kind of cochineal which though apparently beautiful, is not so in effect; that in using this cochineal it is necessary to alum the silk as much as possible, and to add to it more tartar than before mentioned. It is, however, impossible to give any certain rules concerning this matter; the dyer himself will judge of the quality of the cochineal fit for use. He should however use the best; for were it even a fact that the inferior kind, with the assistance of a greater quantity of alum and tartar, gives a colour equal to the best, the silk thus weakened by alum would necessarily be always less perfect. The Genoese manufacturers are so well convinced of this, that they themselves furnish their dyers with cochineal in proportion to the silk given to be dyed."

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Analysis of
the sedi-
ment re-
maining af-
ter dyeing
scarlet or
crimson.

After the operations of dying scarlet and crimson already mentioned, there always remains a brown sediment in the bottom of the liquor, which is thrown out as useless. This, on being examined by M. Hellot, was found to be a precipitated calx of tin, as he has ascertained by reviving the metal from it, though not without great trouble, so that there can be no advantage in repeating his experiments. The remainder of this sediment was composed of the dregs of the cream of tartar united with the gross animal particles of the cochineal. These last being washed over with water, and thus separated from the earthy and metallic parts, were dried separately, and afterwards bruised with an equal weight of crystals of tartar; after which they were ground to an impalpable powder, and boiled with a little alum. Thus they communicated a fine crimson colour to a pattern of white cloth; from which our author is of opinion, that the custom of reducing cochineal to powder and only sifting it, does not give an opportunity of sufficiently extracting the colour from this valuable material; he therefore gives the following receipt for doing so in a more perfect man-

66

How to ex-
tract all the
colour from
cochineal.

ner. "To an ounce of cochineal powdered and sifted as usual, he adds a fourth part of its weight of very white, clean, and dry cream of tartar. These being ground together on a marble stone to an impalpable powder, are used both in the preparation and in the dye, omitting the small quantity of crystals of tartar formerly directed for the preparation." The quantity here directed to be put to the cochineal, he thinks, evidently renders the colour more fixed.

For madder red the preparation is pretty much the same as for kermes, and is always made with alum and tartar. Dyers are not agreed with regard to the proportions. M. Hellot puts five ounces of alum and one of red tartar to every pound of worsted; adding likewise about a twelfth part of four water, and boiling the wool in this solution for two hours. Worsted is to be kept for seven or eight days moist with this solution; but cloth is finished in four days. A fresh liquor is prepared for dyeing this wool; and when the water is sufficiently hot to bear the hand in it, you must throw in, for every pound of wool, half a pound of the finest madder, carefully stirring and mixing it well in the copper before you put in the wool, which is to be kept in for an hour; but without letting it boil, as that would tarnish the colour. Nevertheless, for the dyer's security, it may boil for three or four minutes at the end of the operation; but the more that madder is boiled, the worse is the colour it yields.

67
Of dyeing
yellow.

The third primitive colour spoken of among dyers is that of yellow: and for this M. Hellot observes, that there are ten different ingredients fit for the purpose, though only five of them yield a good and permanent dye. These are weld, savory, green-wood, yellow-wood, and fenugreek.

"Weld or wold generally yields the truest yellow, and is therefore preferred to all the others. Savory and green-wood, being naturally greenish, are the best for the preparation of wool to be dyed green; the two others yield different shades of yellow.

"The shades of yellow, best known in the art of dyeing, are straw colour, pale yellow, lemon colour, and full yellow. The common orange colours are not

simple, and therefore we shall not speak of them at present.

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For dyeing worsted and stuffs yellow, you make use of the usual preparation, viz. of tartar and alum. You allow four ounces of alum to every pound of wool, or 25 pounds to every 100. With regard to the tartar, one ounce to every pound is sufficient for yellow, though it requires two for red. The method of boiling is similar to the preceding. For the welding, that is to say for yellowing, when the wool or stuff has boiled, you make a fresh liquor, allowing five or six pounds of weld to every pound of stuff; some inclose the weld in a clean woollen bag to prevent it from mixing in the stuff; and to keep the bag down in the copper they put on it a cross of heavy wood. Others boil it in the liquor till it has communicated all its colour, and till it falls to the bottom; the stuff is then suspended in the net, which falls into the liquor; but others, when it has boiled, take out the weld with a rake, and throw it away. They sometimes mix yellow wood with this weld; and some dyers mix any of the other ingredients before specified, according to the shade required. By varying the proportions of the salts for the preparation, the quantity of the colouring ingredients, and the time of boiling, it is possible to produce an infinite variety of shades.

"For regular shades of light yellows you proceed as for all other regular shades, only that light yellows require a weaker preparation. For example, 12 pounds and a half of alum to 100 pounds of wool is sufficient. The tartar should also be diminished, because the wool is always wasted a little by the preparation, and that when you require only light shades they may be as easily obtained, by a weaker preparation; thus you save also in the expence of the salts. But these light shades do not so well stand the test as the darker shades, which are dyed with the full proportion of tartar. Some dyers suppose that by letting their wool and stuff remain longer in the dye, they remedy this evil; because they imbibe the colour more slowly in proportion to the weakness of the decoction: if you put wool into the dye, differently prepared, it will in the same time imbibe different shades. These weaker preparations are called *half preparations* or *quarter preparations*, and require great attention, especially for light shades of wool when dyed in the fleece for the manufactory of cloth and mixt stuffs, because the wool is harder and more difficult to spin in proportion to the quantity of alum in the preparation; the stuff is consequently less fine. This observation is not, however, of much importance with regard to worsteds for tapestry, neither with respect to stuffs; but it is not much amiss were it only to show that the quantities of the ingredients used in the preparation are not so very exact; but that they may be varied without any risk, whether to give to the same shades to wool prepared in different preparations, or whether to make but one preparation, if more convenient for different shades.

"In order to dye with yellow wood, it should be split, or rather shaved with a joiner's plane: by this means it is more divided, consequently yields better, so that a smaller quantity will do. Prepare it as you will, it should always be tied up in a bag, to prevent it from mixing with the wool, and from tearing the stuff.

stuff. The savory and green-wood, when used instead of weld, in order to vary the shade, should be inclosed in the same manner.

"To the above mentioned ingredients for dyeing yellow we may here add the root of dock, the bark of ash, especially the second bark; the leaves of the almond tree, peach, and pear tree; in short, all astringent leaves, barks, and woods. These will produce good yellows, more or less fine according to the time they have boiled, and in proportion as the alum or tartar predominates in the preparation. A larger quantity of alum makes it almost as fine as the yellow of weld; if the tartar prevails, the yellow has more of the orange; but if these roots, barks, or leaves, boil too much, the yellow terminates in shades of fawn colour.

"Though several dyers are accustomed for the good dye to use turmeric, a root imported from the East Indies, and which produces an orange yellow, it is however blameable; because the colour very soon fades, at least if not fixed with marine salt, as practised by some dyers who carefully conceal this art. Those who use it for common scarlet, in order to save cochineal, and to give a lively orange red, are also reprehensible; for scarlets dyed in this manner very soon lose their bright orange cast, which darkens by the air. We are, however, obliged in some degree to tolerate the deception; for this flaming colour being so much in vogue, it were impossible to produce it otherwise but by increasing the quantity of composition, the superabundant acid of which considerably injures the cloth."

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To dye silk
of a yellow
colour.

For dyeing silk of this colour it should have about 20 pounds of soap for every 100 of stuff; and after boiling with this ingredient, it should be washed, alumed, and washed again (which is called *refreshing*), when it is to be put upon the rods in hanks of about seven or eight ounces, and then dipped and returned in the yellow liquor. The finest yellow for silk is weld; and the process, as delivered by M. Macquer, is as follows:

"A copper is prepared with about two pounds of weld to every pound of silk; and that all the weld may be well soaked, it is loaded with a large piece of wood. When it has boiled a good quarter of an hour, the bunches are pushed to the far end of the copper, or rather, if you please, taken out; and by means of a bucket or ladle all the liquor may be taken out of the copper, and strained into a copper or wooden trough; that is, by putting a sieve or linen cloth across a trough; by which means the liquor is cleansed from all the grain and little straws left by the weld in boiling. The liquor thus strained is left to cool till you can bear your hand in it: the silk is then dipped and returned till the colour becomes uniform. If this boiling does not make sufficient to fill the trough, it must be supplied with water, which should be added before the liquor is cold, that the degree of heat already mentioned may be preserved. In general, all dyeing vessels should be full, that the silk when dipped may be only two inches from the edge.

"During this operation the weld is a second time boiled in fresh water; and when it has boiled, the silk should be raised at one end of the trough, either up-

on a kind of barrow, or upon the edge of the trough. Half the liquor is then thrown away and replenished by adding of the second boiling as much as was taken from the first, observing to rake and mix the liquor well: such is generally the method when any new addition is made; at least if the contrary is not particularly specified. This new liquor may be used rather hotter than the first; it should nevertheless be always of a moderate heat, because otherwise it would destroy a part of the colour which the silk had already taken, probably owing to the silk being deprived of part of the alum by the heat of the liquor. The silk is returned in this fresh liquor as at first; mean while you prepare a solution of pearl-ash in proportion of about one pound to every twenty pounds of silk.

"For this purpose the pearl-ash is put into a copper, and the second liquor, quite boiling, poured on it, stirring in order to assist the dissolving of the salt. This small liquor is left to subside, and the silk is a second time raised on the barrow or trough, throwing into the liquor about two or three ladles of the clearest of the solution. The liquor is then well raked, the silk replunged, and again returned. This alkali develops and brightens the yellow of the weld. After seven or eight returns, one hank is wrung to try if the colour be full enough and sufficiently bright; if deficient, a little more of the solution of the ashes must be added, and the remainder of the silk done in the same manner till it has taken the shade required. The lixivium, separately prepared, may be added, if you will, at the same time with the second boiling of the weld-liquor; care should be taken however that the liquor be not too hot. This operation is only for yellows, nor would the liquor do for greens.

"For yellow still fuller, approaching to jonquil, when the pearl-ash is added, it may be also necessary to add some rocou, in proportion to the shade required.

"For the light shades, such as pale lemon or Canary-bird, they should be boiled in the same manner as for blues, these shades being much more beautiful and transparent when dipped in a clear ground. To do this, when the weld is ready to boil, some of the liquor should be taken out and mixed with a little clean water and a little of the liquor of the vat if boiled without azure. The silk is then dipped as usual; and if deficient in shade, the weld liquor must be re-added, and the dipping repeated, if necessary, to complete the shade required.

"For deeper lemon colours the weld should boil as for yellows, adding only a certain quantity with clean water, according to the fulness of the shade required: some of the liquor of the vat may also be added if necessary; but these dark lemon colours may be boiled in the common way as for yellows. It must be observed, however, that the blue of the vat is never added to these colours but when it is intended to give them a greenish cast.

"These very pale yellow shades are rather difficult, as they are very frequently liable to be affected by the air, and to deepen too much while drying. This happens when alumed in the common way, which is too much; but this inconvenience may be avoided, if in-

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stead of aluming as for other yellows, a separate liquor is prepared, or even without any particular preparation, only a little alum put into the liquor of the weld.

"In manufactories where they cannot easily procure weld, they make use of the grains of Avignon, and precisely in the same manner; but it gives a less permanent colour."

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To dye cotton yellow.

Cotton to be dyed of a yellow colour should be first well cleansed in a lixivium of fresh wood ashes, and afterwards well washed and dried. Another liquor is then prepared by dissolving in the water, when ready to boil, about a quarter the weight of the substance to be dyed of Roman alum. The skeins are plunged into this alum liquor, returning them on the rods for some minutes. When equally penetrated throughout, the threads by which the skeins are tied being passed on the rods, the hanks are laid on the trough containing the alum liquor. The copper or trough is then covered, it being sufficient to keep the liquor hot without boiling. The cotton, having been thus infused for 24 hours, is then dried, but without washing. We must observe, that the longer it remains dry, the better it takes the colour, and that the washing may be even dispensed with previous to the yellow dye.

A strong weld liquor is afterwards prepared, adding for every pound of the substance to be dyed a pound and a quarter of weld. The cotton or thread, having been previously alumed, is then immersed; the boiling checked with cold water, and the substance worked till it has taken the shade required.

The whole when dyed is plunged into a very hot liquor, but not boiling, made of blue vitriol, a quarter of a pound for every pound of the substance. When it has remained for about an hour and an half, the whole, without washing, is thrown into another liquor composed of about a quarter of a pound of white soap for every pound of the substance. Having been well worked and the threads opened, it should boil for three hours or more if you think proper. The soap might be diminished to half the quantity, but the full proportion does better. This operation finished, the whole is well washed and dried.

If you desire a dark or jonquil yellow, neither the linen nor cotton should be alumed; but for every pound of thread should be added two pounds and a half of weld. When it has been dipped and well worked in this liquor till it has taken the colour equally, it is raised above the liquor, and half a pint of the kelp lixivium poured into it, made as directed in the article upon red. The thread is then returned upon the rods, dipped in this liquor; where having remained for a full quarter of an hour, it is taken out, wrung, and dried.

The lemon yellow is done after the same manner, only that for every pound of thread you put but one pound of weld, diminishing the verdigris in proportion, or even omitting it entirely by substituting in its place the alum liquor. By this means the yellow shade may be varied *ad infinitum*, and without any difficulty; in brightening and fixing the colour, however, the above method must be always observed.

Cotton-velvet is dyed with the root of a plant called *eureum* or *terra merita*, a species of rush which comes

from the East Indies. It gives a beautiful yellow colour; but if dyed in the common manner, has but little solidity. This colour, according to M. de Apligny, may be fixed upon cotton or linen thread by dipping them in a solution of sulphur of antimony in the kelp lixivium already mentioned. When treated in this manner, it is very beautiful as well as permanent.

The fourth primitive colour so called among the dyers, is that which bears the appellation of *fawn* or *root colour*. It is however a kind of brown, and has the name of *root-colour* from being an ingredient in a great number of others. The process for dyeing it is different from those lately described; the wool requiring no other preparation than that of being soaked in water, as already directed for blue. The materials for dyeing it are the green shell of the walnut, the root of the walnut tree, the bark of the alder, *santal*, *sumach*, *roudoul* or *fovic*, and *soot*.

The green shells of the walnut, collected when the nuts are perfectly ripe, and put into tubs or casks, and afterwards filled with water, are in this manner preserved till the year following. The shells are also used before the nuts are ripe; but these should be saved apart, in order to be first used; because, as the soft shell which adheres putrefies, it will keep but for two months only.

The *santal* or *saunders* is a hard wood imported from the Indies, generally ground into a very fine powder, and preserved in bags; because it is supposed to ferment, by which it is thought to be greatly improved; but our author has never observed any difference. This ground wood is generally used with one third of *cariatour* wood; by which, in the opinion of those who prepare it for sale, it is much improved. It is however nothing like so good as the walnut shells; because, if used in too large a quantity, it stiffens considerably, and thereby injures the wool; hence it were best not to use it, either for wool or fine stuffs, except in the slightest shades, where it would not have so bad effect. It is generally mixed with galls, alder bark, and *sumach*, as by this means only you can obtain its colour when not mixed with the *cariatour*. It yields but very little with the preparation of alum and tartar, especially if it be not chipped; but notwithstanding these defects, it is used on account of the solidity of its colour, which is naturally a yellow red brown. The air makes it deeper, and soap lighter. It loses but little by a trial of alum, and still less by tartar.

Of all the ingredients for dyeing *fawn* colours the walnut rind is the best. Its shades are finer, its colour solid; and by making the wool flexible, renders it less difficult to work. It is prepared in the following manner. You fill a cauldron half full of water, and when it grows warm, you add rinds in proportion to the quantity of stuffs to be dyed and to the colour required. It is then boiled; and when it is boiled for a quarter of an hour, the stuffs, having been previously moistened with warm water, are dipped; they are then turned and well stirred, till they have imbibed the colour desired. If for worsteds, requiring an exact assortment of shades, you put less walnut rinds, and begin with the lightest shades. You put more walnut rinds in proportion as the colour is exhausted, and then dip the darkest shades. With regard to stuffs, you

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Of fawn or root colour.

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generally begin with the deepest, and as the colour of the dye diminishes, you dip the lightest. They are aired as usual, dried, and dressed.

The root of the walnut tree is, next to the husk, the best dye for fawn colour: it also gives a very great number of shades, nearly resembling those of the husks; hence they may be substituted for each other, but the root requires a different process. You fill your cauldron three quarters full of river water, putting in the root, cut small, in proportion to the quantity of wool to be dyed, and to the shade required. When it is very hot, you dip the wool or stuff, turning and returning it as before, remembering to air it from time to time; and, if stuff, to draw it through the hands in order to shake off the small bits of the root, which might else spot the stuff. To avoid these spots, the root should be tied in a bag. You afterwards dip the lighter stuffs, and so on, till the colour of the root is exhausted. If worsted, you always begin with the lightest, as for other colours; but of all things you must be careful to keep your liquor from boiling at the beginning, as in that case the first piece of stuff would imbibe all the colour.

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Precautions
to be used
in dyeing
with roots.

The method of dyeing with roots is not very easy; for if you are not very attentive to the degree of heat, to turning and returning the stuffs or worsteds, so as to dip them equally, you run a risk of their being either too dark or spotted, for which there is no remedy. In this case, the only resource is to dye them marone, prune, or coffee colour. In order to avoid this evil, you must keep the stuffs continually turning on the reel, and dip them only piece by piece, nor let the liquor boil till the root has yielded all its colour. The worsteds or stuffs dyed in this manner, should be aired, well washed, and dried.

Nothing more can be said concerning the bark of alder, than what has been already observed with respect to the root of the walnut tree, only that letting it boil at the beginning is not of so much consequence, because it yields its colour less freely. It is generally used for worsteds and colours darkened with copperas. It nevertheless produces a good effect on wool not intended for colours extremely dark, and perfectly withstands the power of the air and sun.

Sumach is nearly of the same nature, and used in the same manner as the husks: its colour is not so deep, and is rather greenish. It is for dark colours frequently substituted for nut galls; but a greater quantity is requisite. Its colour is also perfectly solid and permanent. These different substances are sometimes mixed together; and as they are equally good, and produce nearly the same effect, there is no great difficulty in obtaining certain shades. We must, nevertheless, be directed by custom in the production of these fawn colour shades, which absolutely depend upon the eye, and which are not difficult to manage.

With regard to the mixing of these ingredients with ground santal, you put four pounds of the latter into the copper, half a pound of nut galls pounded, twelve pounds of alder bark, and ten pounds of sumach (these quantities will dye 25 or 27 ells of cloth). The whole is boiled; and having checked the boiling with a little cold water, you immerse the cloth, turning and refreshing it for two hours: it is then taken out, aired,

and washed in the river. You afterwards dip some more stuff in the same decoction, if you want a lighter shade; and in this manner you may contrive as long as the liquor retains any colour. The quantities of these ingredients are augmented or diminished in proportion to the depth of the shade required, letting the wool or stuff boil accordingly.

Here we shall describe also the manner of dyeing ⁷³Of dyeing with foot, though it has less solidity than the others, with foot. and has also the property of hardening the wool, and giving the stuff a very disagreeable smell.

The foot and water is generally put into the copper at the same time, and the whole well boiled. The stuff is then immersed, and more or less boiled according to the shade required; it is afterwards taken out and cooled, and those intended for the lightest shade are then put in; they are afterwards well washed and dried. But the best method is to boil the foot in the water for two hours, to let it stand afterwards, and then to empty the liquor into another copper, without mixing the foot. The wool and stuffs are then dipped in the liquor, and are thereby less hardened than if they had been mixed with the foot: but this does not render the colour more permanent; and indeed it were better never to make use of this ingredient, except for stuffs of little value, especially as it can be supplied by other ingredients already mentioned, and which give a better and more lasting colour, and are besides more softening to the wool. In the dye they frequently employ the green walnut shell, and the root of the walnut tree for their fawn colours. These two substances are useful both for the greater and lesser dye: there are, however, places where it is difficult to meet with them, and where they are therefore obliged to make use of saunders and even of foot.

The last of the primitive colours so called by the ⁷⁴Of dyeing dyers, is black; which includes a vast number of black. shades, from the lightest grey or pearl-colour to the deepest black. Hence it is ranked among the primitive colours in dyeing; for among dyers the word *primitive* does not denote *simplicity*, but only being the original colour from whence a number of others are derived. In order to dye woollen stuffs of a good black, they should first be dyed of a mazareen blue as deep as possible; which is called the *basis* or *ground*, and is to be performed in the manner already directed. The stuff ought to be washed well in running water as soon as it comes out of the vat; and afterwards scoured at the fulling mill; which operation is of the utmost consequence, because without it the subsequent colour will be greatly injured by the lime in the liquor for dyeing blue. This being done, the colour is finished in the following manner. For 100 pounds of cloth put into a cauldron of a moderate size, ten pounds of logwood, cut into chips, and ten pounds of Aleppo galls pulverised, the whole enclosed in a bag: these ingredients are boiled in a sufficient quantity of water for 12 hours. A third part of this liquor is emptied into another cauldron, with two pounds of verdigris; the stuff is then entered and turned for two hours without ceasing. It is necessary to observe that this liquor should boil very slowly, or it is still better to keep it very hot without boiling. The stuff is then taken out, and the second third of the liquor thrown into the copper to the first third, with the

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addition of eight pounds of copperas. The fire under the cauldron is diminished, and the copperas left to dissolve for half an hour, letting the liquor cool, after which the stuff is kept turning an hour; it is then taken out and cooled. The rest of the liquor is then mixed with the two first thirds, carefully squeezing the bag well. To this is added 15 or 20 pounds of fumach: you give it another boil, and then cool it with a little water; having previously added two pounds more of copperas, you again turn the stuff for two hours; it is then taken out, cooled, and again put into the cauldron, turning it constantly for an hour longer. After this it is carried to the river, well washed and scoured at the fulling mill. When it is thoroughly scoured, and the water comes out of it clear, you prepare a fresh liquor with as much weld as you think proper; you give it one boil, cool it, and dip the stuff. This last decoction softens and confirms it a very fine black. For the most part, however, they do not take so much pains; but are satisfied, when the cloth is blue, to dip it in a decoction of nutgalls, and to let it boil for two hours. It is afterwards washed, and some copperas and logwood added to the liquor; after which the stuff is again dipped for two hours, and then washed and scoured.

It may be also dyed in the following manner: for 15 ells of cloth, previously dyed blue, M. Hellot had a pound and a half of yellow wood, five pounds of logwood, and 10 pounds of fumach, put into a cauldron. In this the cloth boiled for three hours; after which it was taken out, and 10 pounds of copperas thrown into the copper. When the copperas was dissolved and the liquor cooled, the cloth was put into it for two hours; it was then taken out and cooled, after which it was again immersed for an hour, and then washed and scoured: it was tolerably fine, but not so velvety as the preceding.

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Experiments to determine whether madding be an advantage in this colour.

It was commanded by the ancient French regulations, that stuffs should be madded after they had been blued, and before they were dyed black. Desirous of ascertaining the advantage resulting from this process, our author took a bit of cloth which had been dyed blue; this being divided, one half was boiled with alum and tartar, and afterwards madded. It was then blackened in the same liquor with the other half which had not been madded, conformable to the first of the two methods just described. They were each of them a very beautiful black; it nevertheless appeared that the madded stuff had a reddish cast: the other black was certainly more beautiful, more velvety, and much finer. There is, indeed, less danger of the madded stuffs soiling the hands and linen, because the alum and tartar of the preparation had carried off all the loose particles. This advantage is not however sufficient to make amends for the inconvenience of madding, as the stuff is always in some degree injured by the alum and tartar, and as the madder gives it a reddish cast disagreeable to the eye, and besides this operation raises the price of the dye to no purpose.

Some dyers, to avoid these inconveniences in part, madder their cloth without having previously boiled it in alum and tartar. But madder used in this manner has no permanency.

N^o 106.

Black is sometimes dyed without having given it the blue ground; and this method of dyeing is used for light or thin stuffs of inferior value, consequently not considerable enough to bear the expence of a deep blue previous to their being dyed black. It is however proper at the same time to give these stuffs a ground of the green walnut shell, or of the root of the walnut-tree, to avoid the necessity of blackening them with too great a quantity of copperas.

This process is attended with no manner of difficulty. The cloth is prepared with the green walnut shell, and afterwards blackened in the manner already described, or as near it as possible. For with black, as with scarlet, most dyers suppose that they are possessed of a secret for dyeing a much finer black than any of their fraternity; this, however, consists in augmenting or diminishing the quantities of the same ingredients, or in substituting others which produce the same effect. M. Hellot has tried several methods; but supposes that what is strictly meant by succeeding to perfection, depends rather on the manner of working, handling, and airing the stuff properly, than upon the exact quantity of the ingredients.

It may not in this place be improper to explain the reason of the necessity of giving stuffs a blue, or at least a root colour ground, previous to their being dyed black; and why the dyeing white black is expressly prohibited in France; because in that case it is necessary to use a much greater quantity of nutgalls: this would indeed be no great evil, as nutgalls of themselves do not injure the wool; but in order to overcome this gall, according to the workmens phrase, that is, to blacken it, or properly speaking rather to form an ink on the stuff, it requires a greater quantity of copperas, which not only hardens the stuff, but, from the acidity impressed on the fibres of the wool by this salt, makes it brittle: on the contrary, when the stuff has had a ground, that is to say, a strong layer of some deep colour, there is much less occasion for either.

Blue is preferable to any other colour; first, because it is the nearest to black, which is in fact only a deep blue; and, secondly, as there is no occasion for any other preparation than previously boiling the wool, the stuff is in no respect injured. For the same reason, viz. the preservation of the wool, the root colour is substituted for inferior stuffs instead of the blue, which would enhance the price; it is therefore necessary that this root-colour ground should be as deep as possible; because the darker it is, there is occasion for less copperas to complete the black.

It also frequently happens, that when stuffs of any colour are badly dyed or spotted, they are dipped in black: it is however advisable to dip them first in blue, unless the colour be very dark, in which case they would take a very fine black; but this is the last resource. These stuffs are not commonly dyed black, if it be possible to make them any other colour; because, having been prepared with alum and tartar for the first colour, the copperas requisite for the black would considerably injure and greatly diminish their quality.

The shades of black are greys, from the darkest to the lightest. They are of great use in the art of dyeing, as well for their own colours simply as when applied

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Why it is necessary previously to dye the stuffs blue.

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How to dye grey colours.

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plied to other colours, which is called *darkening*. At present we shall mention two methods of producing them. The first and most general is to boil some pounded nutgalls with a proper quantity of water for two hours; at the same time dissolving some copperas in a little water separately. Having prepared a cauldron of liquor sufficient for the quantity of wool or stuff to be dyed, you add to it, whilst the water is too hot for your hand, a little of the decoction of the nutgalls with the solution of copperas. The stuff intended for the lightest grey is then dipped. When sufficiently coloured according to your desire, you add some fresh decoction of nutgalls with some of the infusion of the copperas, and then dip the next shade. In this manner you proceed to the darkest shade, constantly adding these liquors, from the tawny grey even to black; but it is much better to give the tawny grey and the extreme dark shades a blue ground, more or less as you like, for the reason above mentioned.

The second method of producing grey seems to be preferable; because the juice of the galls is better incorporated with the wool, and you are thereby sure of using no more copperas than is absolutely necessary. It even appears that the greys are more beautiful and the wool brighter. It also appears to be equally solid; for they are both of them equally proof against the air and sun. The second method is much less prejudicial to the quality of the wool, and is attended with no more difficulty than the first.

You boil a sufficient quantity of nutgalls, well pounded and inclosed in a clean linen bag; you afterwards put the wool or stuff into this liquor, letting it boil for an hour, moving and stirring it about, after which it is taken out. You then add to the same liquor a little copperas dissolved in a part of the solution, and then dip the woollens intended for the lightest shade. You again add a little of the copperas solution, continuing in this manner as in the first operation till you come to the darkest shades. In either process, if not restrained by patterns, you may catch the precise shades, beginning with the dark and finishing with the light, in proportion as the liquor becomes exhausted of its ingredients; keeping the pieces of stuff or wool immersed for a longer or shorter time, till the stuff takes the colour desired.

It is as impossible to determine the quantity of water necessary for these operations, as it is to specify the quantity of the ingredients, or the time for letting the wool remain in the liquor. The eye must judge of these things. If the liquor be strongly impregnated with colour, the wool will imbibe the shade in a short time; but, on the contrary, it must remain longer if the liquor be exhausted. When the wool is not dark enough, it is dipped a second time, a third, or even more, till it is of a sufficient colour; the only necessary attention is to prevent the water from boiling. If it be by chance too deep, the only remedy is to dip the stuff in a fresh warm liquor, adding to it a little of the decoction of nutgalls. This liquor carries off a part of the precipitated iron of the copperas; consequently the wool or stuff becomes lighter.

But the best way is to take it out of the liquor from time to time, not leaving it in long enough to imbibe

more of the colour than required. It may also be dipped in a solution of soap or alum; but these correctives destroy a great part of the colour, so that it is often necessary to darken it again; by this means the wool, which suffers greatly by the reiterated action of these ingredients, is injured. All greys, however dyed, should be well washed in a large stream, and the darkest even scoured with soap.

These dingy shades, from the lightest to the darkest, are produced by the same operation from which common ink is obtained. The green vitriol contains iron; were it blue, it would contain copper. Pour a solution of this green copperas into a glass, holding it in the light and dropping into it some of the decoction of nutgalls. The first drops that fall into this limpid solution of ferruginous salt produces a reddish colour, the next turns it bluish, then a dusky violet colour, and at last it becomes a dark blue, almost black, which is called ink. To this ink add a quantity of pure water; let the vessel rest for several days, and the liquor by degrees becomes clearer and clearer, till it is almost as limpid as common water, and at the bottom of the vessel you will perceive a black powder. Having dried this powder, put it into a crucible; calcine this, and put to it a little suet or any other fat, you will obtain a black powder which may be attracted by the loadstone. This, therefore, is iron; this is the metal which blackens the ink; and this, when precipitated by the nutgalls, lodges in the pores of the fibres of the wool, dilated by the heat of the liquor, and contracted when the stuff is exposed to the air. Besides the styptic quality of the nutgalls, by which they have eminently the property of precipitating the iron of the copperas and producing ink, they also contain a portion of gum, as may be ascertained by evaporating the filtered decoction. This gum being introduced into the pores with the ferruginous atoms serves to retain them; but this gum being easily soluble, it has not the tenacity procured from a salt more difficult of solution; therefore these dark colours have not the solidity of other solid colours prepared in a boiling solution of alum and tartar, and therefore plain greys have not been submitted to the usual trial.

It is by no means easy to produce a good black colour on silk, though the basis is undoubtedly the same, viz. iron dissolved by acids, and precipitated on the cloth by a vegetable astringent. The following process is given by M. Macquer. "Twenty quarts of vinegar are put into a trough with one pound of black nutgalls pounded and sifted, and five pounds of fresh iron filings. While the infusion is making, you clean out the copper in which you put the black ground, with the following drugs pounded, viz.

8 lb. of black nutgalls	3 lb. of agaric
8 — of cummin	2 — of coque de Levant
4 — of sumach	10 — of buckthorn
12 — of pomegranate rind	6 — of linseed.
4 — of bitter apple	

"These several drugs are put into a copper, containing half the quantity of the vessel used for the black ground, and filled with water. Twenty pounds of Campeachy or logwood chips are afterwards inclosed in a linen bag, for the conveniency of taking them out

of the liquor, unless you choose to take them out with a pierced ladle, or any other means, because these must boil a second time as well as the other drugs.

"When the logwood has boiled for about a quarter of an hour, it is then taken out and properly preserved. The above-mentioned drugs are then put into the logwood decoction, and also boiled for about a quarter of an hour, carefully checking with cold water as often as it seems ready to boil over.

"This operation being finished, the liquor is strained through a linen strainer into a trough, and then left to settle, carefully preserving the grounds which must be again boiled.

"The cold infusion of the vinegar with the nutgalls and iron filings is then put into the copper intended for the black ground. The fire is afterwards put under it, and the following ingredients immediately added, viz.

20 lb. of gum arabic pound- ed	2 lb. of green copperas
3 — of realgar or red arsenic	2 — of the scum of su- gar candy
1 — of sal ammoniac	10 — of powder sugar
1 — of sal. gem.	4 — of litharge pound- ed
1 — of mineral crystal	5 — of antimony
1 — of white arsenic pounded	2 — of orpiment
1 — of corros. sublimate	2 — of plumbago.

These several drugs should be pounded and sifted, except the gum arabic, which is only broken.

79.
How to use
the native
gums in
this opera-
tion.

"Instead of gum arabic the native gums may be used, and dissolved in the following manner: Some of the logwood decoction is put into a boiler; when hot, you put into it a copper strainer, made in the shape of an egg, and open at the largest end. The gum is put into this strainer, and dissolves as the liquor heats; it must be stirred with a wooden pestle, that it may pass through the holes. When it is entirely passed, you introduce another copper strainer, with holes still smaller than the former, to prevent the impurities of the gum from escaping. The liquor of the gum already dissolved is poured into this strainer, and again passed as before by the help of the pestle. This operation is made more easy, by now and then taking out the strainer and resting it on a cross shelf or plank, suspended on the peg over the copper used for wringing the black. The gum must be squeezed pretty hard with the pestle to force it through the holes of the strainer.

"The gum would dissolve with more facility if previously steeped for three or four days in the logwood decoction, especially if you are careful to pour it on very hot.

"When the above ingredients are put into the black ground, you must remember to keep the liquor hot enough to dissolve the gum and the salts, but it should never be suffered to boil; and when it is therefore sufficiently hot, the fire is taken away, and the fresh iron-filings sprinkled over it in a proper quantity to cover the liquor.

"The next morning the fire is again put under the copper, the drugs boiled, and the logwood a second time boiled. It is then taken out, and the following drugs added to this second decoction, viz.

2 lb. of black nutgalls pounded	6 lb. of pomegranate rinds pounded
4 — of sumach	1 — of bitter apple
4 — of cummin	2 — of agaric pounded
5 — of buckthorn ber- ries	2 — of coque de Levant
	5 — of linseed

These drugs are boiled, the liquor strained and poured on the black ground as we have already said, and the grounds preserved. You then put a little fire under the copper as at first, and the following drugs are immediately added, viz.

8 oz. of litharge pounded	8 oz. of rock salt
8 — of antimony pound- ed	8 — of fenugreek
8 — of <i>plumb de mer</i> , also pounded	8 — of corrosive subli- mate
8 — of white arsenic pounded	8 lb. of copperas
8 — of crystal mineral	20 — of gum arabic, pre- pared as above

"When the liquor is hot enough, you take away the fire, strewing over the liquor with the iron-filings, and letting it stand for three or four days.

"Two pounds of verdigris are then pounded and dissolved with six quarts of vinegar in an earthen pot, adding to it about an ounce of cream of tartar. The whole should boil for a full hour, taking care to check the boiling with cold vinegar that it may not boil over. This preparation should be kept ready to be added to the black ground when you are going to dye.

"For the black dye the silk is boiled as usual; having washed and beetled according to custom, you give the gall liquor for heavy blacks twice, but for light blacks only once. These two blacks are alike both in beauty and shade, differing only in the weight of the silk: the light black has, however, rather more lustre.

"The nutgall liquor is made as follows: For every pound of silk you must have three-quarters of a pound of light nutgalls, adding the same quantity of Aleppo. These galls are pounded together, and boiled for two hours in a quantity of water sufficient for the whole of the silk to be galled. As the liquor wastes a great deal in the boiling, it is, after the first hour, filled again, and after two hours the fire is taken away; the liquor is then left to deposit, and the galls taken out with a pierced ladle; about an hour afterwards the silk is put into it, prepared as above.

During this operation the silk is drained and very lightly squeezed: it is then immersed in the gall liquor, on cords one above another, taking care to keep it near the surface of the liquor, but sufficiently covered. In this manner it should remain 12 or 15 hours; it is then taken out, washed at the river, and if intended for heavy black, is a second time galled in a fresh galling like the first; the grounds are generally used for the first galling; but for the second a liquor of fresh drugs.

"Some dyers gall the heavy blacks but once, by boiling the old grounds, taking them out immediately, and afterwards adding fresh galls; for every pound of silk a pound of light gall and half a pound of fine Aleppo. The fresh galls they boil for two hours or more, and when the grounds are taken out they put the

the silk in the fresh gall liquor, where they let it remain a day and a night.

" This method, they say, is the best ; because, were the gall grounds to remain in the liquor, they would re-imbibe part of the substance which they had before given to the water.

" When the silk is galled, a little fire is put under the black ground ; while it is heating, the silk is wrung out of the galling, and beetled at the river.

" When washed it is drained on the pegs, passing a thread round every hank, each hank as large as for common colours : it is then immediately put on the rods.

" While the black liquor is heating, it should be stirred with an iron rake or paddle, to prevent the grounds from sticking to the bottom of the copper. You then dissolve some French gum by the method above described, till it rises on the top in a kind of scum covering the surface of the liquor ; afterwards you throw into it two or three handfuls of linseed. You then add half of the vinegar and verdigris preparation with about four or five pounds of copperas ; this should be punctually repeated at every heating.

" Care should be taken whilst the fire is under the copper to rake ; and, to try if it be hot enough, the rake is moved round at the bottom of the copper ; if the gum sticks to the rake, and the liquor does not appear through the middle of the gummy scum, it shows that it is hot enough : the fire is then taken away, because, as we have before observed, it should not boil. The rake is then also taken out, and the liquor covered with iron-filings in the same manner as before ; after this it is suffered to subside for about an hour, when the surface of the liquor is again stirred, in order to precipitate the filings to the bottom.

" Before we explain the manner of dipping silk in the black liquor, it is proper to observe that silk-dyers never dye black but by coppers, that is when they have a sufficient quantity of silk for three dips, if for heavy black ; but if light black only two dips, which is done in the following manner :

" If heavy black, a third of the silk is put upon the rods, and three times returned in the black ground ; it is afterwards wrung on the peg over the copper ; this is done by giving it three twists : in this manner three hanks may be wrung at once, because it should be done gently, and only to drain ; it is again put on the rods, and suspended between two perches to air.

" While the first silk is airing, the second third part is dipped in the same manner, and afterwards the third third part, always in the same manner. It must be remembered, that while the silk is on the rods it should be turned from time to time to give it air.

" When the last third part is wrung, the first part is put in, and then the two others successively for three times, always airing at each time. This is commonly called giving the three wrings, and these three wrings are called one fire or heating.

" The light blacks should also have three wrings to one fire.

" After each fire the black ground is again heated, adding copperas and gum as before. This operation is thrice done for the heavy blacks, that is three fires, each fire consisting of three wrings ; but for light blacks only twice, each also consisting of three wrings.

" It must be observed, that at every reheating it is requisite to change the order of dipping, in such a manner that each may in its turn have the first of the liquor. If the black dye is strong and good, the heavy blacks may be done with two fires only ; and for the light blacks one wringing less may do for each heating.

" When blacks are finished they are returned in a trough of cold water by dips one after another, called by the French dyers *disbroder* or rinsing ; they are then twice or thrice beetled at the river. When washed you put them on the cords, only taking care not to press them too much.

" The silk when taken out of the black dye is extremely harsh, which is by no means wonderful, considering the number of acids and corrosives in the composition. It is therefore necessary to soften it in the following manner :

" Dissolve about five pounds of soap in two buckets ^{To soften} of water ; and while the soap is dissolving, throw in ^{black silk.} a handful of aniseed or any other aromatic plant. It should boil till the soap is entirely dissolved. In the mean time a trough should be provided full of cold water, and large enough to dip all the silk at the same time. The soap-water should be strained through linen, the whole mixed well together, and the silk put in, where it should remain a full quarter of an hour. It is then taken out, wrung on the peg, and dried as usual. As the quantity of soap can do no harm, too much is better than too little. This softening is very necessary, in order to divest the silk of that rustling and stiffness so prejudicial in the manufacture of black goods.

" To dye black in the raw, the silk should be galled ^{To dye} in a cold liquor of fresh galls, which had been previ- ^{black in the} ously used for the boiled silk. The natural yellow of ^{raw.} the silk is preferable for this dye, because the white takes a less beautiful cast.

" Having untied the silk and divided it into hanks of the common size, it is dipped with the hands into the gall liquor. When soaked and a little squeezed, it is strung on cords, eight or ten hanks together.

They are afterwards put into the cold gall-liquor, one above another, letting even the cords sink in the liquor, where they may remain for six or seven days. They are then taken out and once beetled at the river. As to time, it should remain in the galling according to the strength of the liquor and the quantity of the silk put into it ; but however strong it may be and however small the quantity of silk, it should remain two or three days at least.

" When the silk is washed, it is again strung on the cords and left to drain, after which the cords are put one over the other into the rinsing or black wash, which is of itself sufficient to dye ; it will, however, require more or less time according to the strength of the rinsing wash, generally about three or four days. Whilst the silk is thus immersed in the rinsing water, it should be raised with sticks three or four times a day ; it is then drained over the liquor, and when drained put on the ground in a proper place, where it is spread and aired, but not dried. This is absolutely necessary to produce the black, else the silk might take a black-grey ; this grey would, however, blacken in the air ; nevertheless you are thereby enabled to

judge how much of the colour it has taken, and how much it may still want. Should the silk be suffered to dry, it must be again wetted before it is re-dipped, which would be an additional and unnecessary trouble.

"This operation of washing and drying must be successively continued till the silk is sufficiently black.

"The silk in this situation is carried to the river, and twice beetled; after which it is drained on the cords, and then put on the perches to dry without wringing, which would soften it too much: for as this kind of silk is designed for gauzes and black lace, care should be taken to preserve its natural stiffness as much as possible.

"To produce black in the raw in the quickest manner, the silk when washed from its galling should be put on the rods and three times returned in the blacking ground; it is then taken out, and put to drain over the vessel containing the black liquor, and then cooled on the rods.

"When drained, it is again twice dipped in the black liquor, drained, and each time cooled as at first. When drained, it is again washed; and the procedure is then the same as for those which had been dyed in the rinsing. This is not, however, the usual method of dyeing black in the raw; because it consumes the black liquor too soon, considering with what avidity the raw silk takes any colour whatever; and besides that a good rinsing is sufficiently strong for dyeing this colour.

"The black dye is weakened and becomes exhausted in proportion to the silk it has dyed; it is therefore necessary to strengthen and replenish, from time to time, by an addition of proper drugs, which is called giving the *brevet* or *composition*.

"This composition is made by putting four or five buckets of water into a copper, and then boiling it with about four pounds of logwood chips. The logwood is then taken out, and four pounds of black buckthorn berries is added with two pounds of pomegranate rind, two pounds of sumach, two pounds of *Coque de Levant*, two pounds of coliquinte, two pounds of linseed, and four pounds of cummin.

"These drugs are boiled together for about three quarters of an hour; the fire is then put under the black liquor, when a little more than half boiled, and whilst hot the following drugs are added, viz.

2 lb. of realgar	1 lb. of white arsenic
4 — of antimony	1 — of corrosive sublimate
1 — of gold litharge	1 — of orpiment
1 — of silver litharge	1 — of powder sugar
1 — of sal ammoniac	1 — of funegreek
1 — of rock salt	4 — of copperas.
1 — of crystal mineral	

"These drugs, when all pounded, are thrown into the black ground, remembering to stir. When the composition is sufficiently boiled, it is strained in a trough and left to settle; the grounds having subsided, the clear part is added to the black ground. The same grounds are again boiled and preserved for some other time.

"The composition being added to the black liquor, and sufficiently hot, the fire is taken away. The liquor is then strewed over with the iron-filings, and left to settle for two days.

"When the black ground has had a certain number

of additions, and a quantity of sediment collected at the bottom, part of the grounds should be taken out in order to clear the liquor. Thus frequently replenishing, the foundation is always preserved; so that the liquor is never entirely new, but having been once set in a dye-house is set for ever. These liquors are never liable to putrefaction, owing to the great quantity of nutgalls and martial vitriol in the composition, two of the most powerful antiseptics known.

"The most material observation concerning the black dye is, that in general it greatly injures the goods in such a manner that stuffs of this colour, though not inferior in other respects, wear out much sooner than those of any other. This defect may be attributed to the vitriolic acid of the copperas, which is but imperfectly saturated with the iron. Iron combined with any, even vegetable, acid, is capable of producing black with vegetable astringents. It is therefore most probable that this inconvenience might possibly be removed, by substituting other combinations of this metal for the copperas, if it were worth while to make the attempt."

"All kinds of grey, excepting black grey, are produced upon silk without aluming. The silk being washed from the soap and drained on the peg, a liquor is made of fustic, logwood, archil, and copperas. Fustic gives the ground; archil the red; logwood darkens, and the copperas softens all these colours, turns them grey, and at the same time serves instead of alum in extracting them. As there is an infinite variety of greys without any positive names, and produced by the same methods, it would be endless to enter into a detail that would prolong this treatise to so little purpose." 82
Of dyeing
silks grey.

Suffice it to remark here, that in producing a reddish grey the archil should predominate; for those more grey, the logwood; and for those still more rusty and rather greenish, fustic.

In general, when obliged to complete the colour with logwood, it should be used rather sparingly, because it is apt in drying to darken too much, differing in this particular from all other colours.

To give an example of the manner of producing these colours we shall take the nut-grey.

The fustic decoction, archil, and a little logwood, is put into water moderately hot. The silk is then returned, and when the liquor is exhausted it is taken out; and to soften the colour the copperas solution is added. Some dyers for this purpose add the black wash instead of the copperas; the silk is again returned; and if the colour does not appear sufficiently even, some red spots still remaining, it may be concluded that it requires a little more copperas.

It must also be remembered, that as copperas is the general base of all greys, if deficient in quantity, the colour will be apt to change in drying, and to become rough and uneven.

To try if the colour be sufficiently softened, it should be examined; and if it wets easily, after having been wrung on the peg, it wants copperas; but if on the contrary it soaks with a little difficulty, the colour is enough softened.

On the other hand, too much copperas stiffens the silk considerably, making it harsh, and even depriving it of a great part of its lustre. To remedy this, the

filk when taken out of the liquor should be wrung on the peg, and then immediately washed at the river, which carries off the superfluous copperas.

The black greys, because alumed and welded, make a separate class. When the filk is alumed and cooled at the river, and the weld liquor prepared as for yellows, the filk is returned; and when the liquor is exhausted, a part of it is thrown away, and the logwood decoction substituted in its place. The filk is again returned in this liquor; and when the logwood is exhausted, some copperas may be added in a sufficient quantity to blacken the colour. The filk is then washed, wrung, and finished as usual.

For iron grey, it is necessary to boil the same as for blues. This colour is much more beautiful when laid on a very white ground. It is more used in the manufacturing of flockings than any other colour, therefore generally wrought in shades; that is, many different shades made at the same time.

When the filk is washed and prepared as usual, you make the liquor of river or well water, no matter which; but either must be cold.

If river water, the logwood decoction made with river water is added, sufficient to produce the dark shade required; the filk is then dipped, and when finished it is wrung and hung up. A part of the liquor is then thrown away and replenished with water for the following shades, and so on to the lightest, carefully dividing; that is, preserving an equal distance between the shades.

When all is finished with the logwood, the dark shades are put again on the rods, to be dipped in a new liquor with the addition of copperas; the remaining lighter shades are then dipped in the same liquor, but without the copperas addition: if, however, the second shade is not enough softened, a little copperas must be added. This defect is easily perceived in the dipping, as we have before observed.

When arrived at the lightest shades, care should be taken that the liquor be not overcharged with copperas, which is easily perceived by its having a reddish cast; in which case some of the liquor should be thrown away and replenished with water, too much copperas producing the same effect with regard to these shades as the preceding.

When the liquor is made with well water, the logwood decoction should also be made of well water. This being added to the liquor, the darkest shades are first dipped as in the preceding process. When the filk has sufficiently drawn, it is taken out, and the following shades are then dipped, but without replenishing, the colour being much better and clearer without the river water.

When all the shades are complete, you soften with copperas, in the same manner as above described; the filk is afterwards washed, and if necessary beetled.

83
To discharge grey
colours
from filk.

To discharge greys, that is when the shades are too dark and too full, you put some tartar pounded in a mortar and sifted into a bucket or small trough; you then pour over it some boiling water. The clearest of this liquor is afterwards put in a trough, and the filks returned in it; by which operation a part of the colour is immediately discharged.

If the filk does not instantly take an equal colour, a little more tartar must be added as above mentioned.

The filk thus discharged of its superfluous colour is once beetled at the river, and afterwards dipped in hot water, without any other addition. This last operation restores in part what it had lost by the tartar; but to try the colour it should be wrung on the peg.

The tartar always destroying some part of this colour, it should be restored with a fresh liquor made for the purpose, and then softened with copperas as usual.

If the filk has been alumed, then the hot water may be omitted after the beetling; the hot water is, however, always of use in removing the harshness occasioned by the tartar.

To discharge iron greys when too dark, they should be sulphured, afterwards beetled at the river, and then again dipped in a fresh liquor similar to the first.

This method of discharging iron greys is preferable to either tartar or lemon juice, these ingredients giving them a ground that does not easily yield even to the boiling with soap, which consequently spoils the colour; whereas the sulphuring almost entirely whitens the filk by totally destroying the logwood.

For greys in the raw, the filk should be as white as for common colours, except the black grey, for which the natural yellow would be no disadvantage. Having soaked the raw filk, the process is then the same for producing these shades as on boiled filk.

Cotton or linen receive a black colour with still more difficulty than filk. ⁸⁴ Of dyeing cotton or
"The various processes (says M. de Apligny) for dyeing black, agree in the linen black-
sole intention of introducing within the pores of the stuff ferruginous particles dissolved in different menstrea, and of precipitating them on the stuff by means of astringent substances furnished with phlogiston capable of colouring iron black. The best method therefore of succeeding, is to choose a solvent capable of dividing the particles so minutely that the calx may not injure the stuff. Copperas or green vitriol are used in these processes; but the iron it contains is by no means in a state of perfect division, on account of the phlogiston obstinately retained by it, which facilitates its union with the acid without the iron being perfectly dissolved. It is for this reason, doubtless, that a solution of green vitriol in water deposits in lime a species of ochre; which, according to M. Geoffroy, seems to be an extraneous substance. For the same reason the spirit of nitre, saturated with iron, will dissolve still more, by abandoning the grosser particles of what is held in solution, and of which it retains only the phlogiston.

⁸⁵ Cause of
"This being the case, whenever copperas is used in dyeing of black, the stuffs dyed are generally harsh to the feel and considerably damaged; because the gross particles of the iron being only divided, and not dissolved by the vitriolic acid of the copperas, overfill the pores of the stuff into which they had entered, and by their hardness extending the partition of these pores, force them asunder. M. Hellot very well observes, that cloth dyed black without a blue or root ground requires a greater quantity of copperas, by which the stuff is rendered rotten; but I have also remarked, that when dissolving the rust of iron in vinegar, either for yellow or for the black of painted linens, it is apt to tear in the parts where these colours are applied, particularly if there has been no attention to take off the grosser earth by scumming the solution. To this

this earth therefore the rottenness of black stuff may be attributed; and not, as vulgarly imagined, to the salt of vitriol, nor to any other burning cause.

86
Composi-
tions for
dyeing
black im-
proved by
age.

"And therefore, in order to render the colour more equal, and the stuffs less damaged, the best method for black is to use a solution of iron perfectly divided. Consequently, as experience daily teaches, those acids which attack the iron too rapidly are the least proper to produce a perfect solution of this metal. Weak acids are therefore preferable; which, notwithstanding their slow operation, penetrate entirely, dividing it into impalpable particles. Black compositions also succeed much better in proportion as the black liquor is older, and consequently the solution of the iron more complete. The manufacturers in India are so truly sensible of this consequence, that many of them preserve their black vats for more than 20 years. In the states of Genoa, Florence, and Naples, every manufacturing city has a place of reserve, called the *Seraglio*, where at the public expence eight or ten vats are continually supported. These vats have been set from 300 to 400 years, more or less; that is, prepared for the dipping of silk designed for black, and requiring only to be supplied with proper drugs in proportion as they are diminished by use. The ground remaining always the same, forms a kind of leaven, by which the fermentation of the necessary additional drugs is assisted.

87
Rouen pro-
cess for dye-
ing cotton
or linen
black.

"The process at Rouen for dyeing linen and cotton thread black, is first to give it a sky-blue ground, and then to wring and dry. It is afterwards galled, a quarter of a pound of galls for every pound of the substance (as for reds); having remained 24 hours in the gall liquor, it is again wrung and dried.

"About five quarts of the black liquor for every pound is then poured into a trough. The cotton is then dipped and worked with the hand, pound by pound, for about a quarter of an hour, then wrung and aired. This operation is twice repeated, adding each time a fresh quantity of the black liquor carefully scummed. It is again aired, wrung, washed at the river, well drained, and dried.

"When this cotton is to be dyed, about one pound of the rind of the alder-tree for every pound of thread is put into a copper and boiled in a sufficient quantity of water during one hour. About half the liquor that had been used for the galling is then added, with about half the weight of the rind of the alder of sumach. The whole is again boiled for two hours, after which it is strained through a sieve. When it is cold, the cotton is dipped in it on the rods, and worked pound by pound; from time to time airing, and returning it into the liquor; where having remained 24 hours, it is wrung and dried.

"For softening this cotton when too harsh, it is the custom to soak it in the remainder of the weld-liquor that had been used for other colours, adding a little of the logwood-liquor. It is then taken out, and instantly plunged into a trough of warm water, into which had been poured about an ounce of the oil of olives for every pound of the substance: it is then wrung and dried.

88
Process of
the Abbé
Mazéas.

"M. l'Abbé Mazéas has given a process for the dyeing of linen and cotton thread black, by madder-
ing after having prepared with the sickiou of the A-

drianople red, galling and dipping in an astringent composed of lime-water and green copperas calcined. This process, though long and expensive, is in my mind no better than those I have just described. In order to obtain a permanent black, it is my opinion that we must still have recourse to the black resulting from a combination of the three primitive colours, until we discover *seculæ* capable of yielding a direct black. I shall now describe a process in which I myself have succeeded perfectly.

"To dye linen and cotton thread black by a combination of colours, it is necessary to begin by cleaning the thread as usual by galling, in the same manner as mentioned in the article upon red, aluming afterwards, and then dipping in a weld-liquor. When taken out of this liquor, it must be dyed in a decoction of logwood, to which has been added a quarter of a pound of blue vitriol for every pound of the substance. It is then taken out, washed at the river, wrung, and washed several times, but not wrung hard. It is at last dyed in a madder liquor, about half a pound of this dye for every pound of the substance. It is needless to repeat here the manner of galling, aluming, and welding, &c. having described them above. By this process we may rest assured of obtaining a very beautiful and permanent black, that will not be liable to be discharged, provided that after having been dyed the thread be dipped in a boiling soap-liquor.

"Several different shades of grey are distinguished in the art of dyeing; viz. black-grey, iron-grey, slate-grey, thorn-grey, agate-grey, &c. It is easy to conceive, that grey in general, being a mixture of black and white, its different shades can be obtained only by introducing into the subject a small quantity of matter, by which the rays of light are absorbed in such a manner, that some of the pores not being occupied, reflect all the rays, and present to the eye a grey colour by means of the black particles contained in the intermediate pores. This operation in dyeing is therefore precisely the same as in painting, which produces grey by a mixture of lamp-black and of white lead.

"It would be too tedious, and even superfluous, to describe the different processes for the several greys just mentioned. The dyer will be better able to judge of these shades by his eye than by any particular rules. All that can be said is, that it is the common practice to give a blue ground to black-grey, iron-grey, and slate-grey; but to none of the others. These shades require aluming in proportion to the shade wanted, and are even frequently galled with liquors that had been previously used.

"The thread having been first galled, wrung, and dried, is dipped on the rods in a trough full of cold water, adding an arbitrary quantity of the black liquor and of the logwood decoction. The thread is then worked pound by pound, washed, wrung, and dried.

"It is possible to produce more permanent greys by the two following processes. First, by galling the thread, by dipping in a very weak black vat or liquor, and afterwards madding. Secondly, by dipping the thread in a very hot solution of crystals of tartar, lightly wringing, and then drying. The thread is then dyed in a decoction of logwood. It appears black; but by dipping the thread, and working it attentively in a hot solution of soap, the superfluous dye being discharged,

89
Of M. de
Apligny, by
a combina-
tion of co-
lours.

90
Of dyeing
cotton and
linen of a
grey colour.

ged, it remains a slate-grey, very pretty and very permanent."

91
Of compound colours.

Having described in such a particular manner the methods of dyeing the primitive colours, there can be very little difficulty in comprehending the management of those which proceed from a mixture of them. But though an infinite number of different shades may be formed from those already mentioned, we are not to imagine that a good colour will be produced by the mixture of any two at random. Thus, though you mix blue and scarlet together in any way you please in order to produce a purple, the colour will neither be good nor uniform, owing to the opposite action of the acid and alkaline ingredients by which these two primitive colours are struck. With crimson the case is altered: for, as we have already seen, that colour is produced in the greatest perfection where volatile alkali is concerned; and therefore the alkaline ingredients of the blue, which can only tend to heighten that property in the other colour, have no such pernicious tendency. From a mixture of blue and crimson, therefore, are produced columbine, purple, amaranth, pansy, violet, with innumerable other shades, varying according to the depth of the original colours employed. In all these compound colours, it is necessary to dye the stuff completely of one colour, and then proceed with it for the other exactly as if it had been quite white. In the present case, you must begin with blue; because, though the indigo cannot be hurt by the ingredients necessary for dyeing crimson, yet the cochineal would be very considerably injured by the lime used for dissolving the indigo. Colours of an inferior kind are produced from madder.

92
Purple, &c.

93
Green.

Blue and yellow produce a green, which is always essentially the same; though there are also innumerable shades of it which go by different names, as yellow-green, pale-green, bright-green, grass-green, sea-green, olive-green, &c. &c. These are all dyed by the general method already mentioned, viz. a yellow dye super-added to a blue ground; though they differ in some particulars in respect to the various shades above mentioned.

For yellow-greens, M. Hellot directs the stuff to be a fine light blue, boiled with the common quantities of alum and tartar, and then dipped in the yellow dye in order to receive a strong colour, that the yellow may predominate. For those shades called *cabbage* and *parrot greens*, or any others more inclining to blue, it is requisite that the latter should be very deep and the yellow dye weak, or that a smaller quantity of salts should be used in the preparation. This last method, however, is not approved of by M. Hellot; and indeed it is natural to think, that a great quantity of colour with little of the preparation necessary to make it adhere and brighten it, must be much less durable, as well as less beautiful, than one where the colour and preparation are in due proportion to one another.

A very beautiful green will be produced by dipping a deep blue cloth in the decoction of the *virga aurea* Canadensis, provided the stuff after being dyed blue has been boiled in a solution of three parts of alum and one of white tartar. This green is equally permanent with that dyed with weld. A very permanent green is also produced by the bark of the ash-tree, but less beautiful than the other. A duck's-wing

green is produced by using the root of the sharp-pointed dock grossly powdered and in sufficient quantity. For this the stuff must be dyed first of a dark blue; then well scoured, and afterwards boiled in a solution of four parts of alum and one of tartar; and, lastly, it must be boiled full two hours with the other colouring ingredient the dock-root. By this root also many various shades of colour may be obtained from the palest yellow to a tolerable olive; so that our author thinks it is a considerable acquisition in the art of dyeing.

Sea-green is usually dyed, according to M. Hellot, with verdigris; and the following, he says, is the Dutch method of doing it, and which produces a more permanent colour than usually is obtained by means of that ingredient. "Two cauldrons are to be placed at a little distance from each other; in one of which you put two pieces of cloth of 40 or 50 ells in length, with eight or ten pounds of white soap shaved, and which must be perfectly dissolved. When the mixture is ready to boil, the stuff should be immersed, and suffered to boil a full half hour. In the other cauldron you must prepare another liquor; and when that is quite hot, you put into it a clean linen bag, containing eight or ten pounds of blue vitriol, and ten or twelve of lime, each of them well pulverized and mixed together; it being necessary that the mixture should be as accurate as possible. This bag should be moved about in the water, hot, but not boiling, till the vitriol is dissolved. A winch is then to be fixed on in the usual manner; but which ought to be carefully wrapped round with a clean linen cloth very tight and well sewed. One end of the cloth is fixed on the winch, which is then turned swiftly round, that the cloth may pass swiftly from the soap-cauldron into that with the vitriol; and here it is turned more slowly, that it may have time to imbibe the particles of the copper, which by means of the lime were diffused in the liquor by separating and precipitating them from the blue vitriol in which they were contained. The cloth is left in this liquor, which should never boil till the cloth has taken the sea-green colour desired. It is then to be taken out, drained on the winch, and aired by the lifting. It should hang till it is perfectly cold before it be washed at the river. If it touches wood it will be spotted; for which reason, the winch, and every thing of wood over which it must pass, ought to be well covered with linen."

94
Dutch method of dyeing sea-green.

On examining this process by the principles of chemistry, it appears to be no other than impregnating the cloth with a solution of copper in fixed alkali. It is undoubtedly a mistake to say, that it is done by verdigris; for no verdigris can be formed from blue vitriol, lime, and soap. All that we can say of it is, that it is cloth impregnated with a combination of copper with fixed alkali; which being naturally extremely ready to unite with water, and having very little attraction for the cloth, the latter may be supposed to be painted rather than dyed with it. A much better method, therefore, seems to be that recommended by M. Hellot, of first dyeing the stuff a very light blue, and then giving the necessary yellow with *virga aurea*.

These receipts may serve as specimens of the methods of dyeing all kinds of mixed colours. There are, however, methods of producing both a blue and green from indigo itself, by dissolving it in acids; and

95
Saxon blue
and green.

the colours so produced are called *Saxon blues* and *greens*. Being perishable colours, they are now seldom used; though Mr Wolfe some time ago published a receipt in the Philosophical Transactions for preparing them after an improved method. This method, for the blue, was to dissolve indigo in concentrated oil of vitriol by digesting them in the heat of boiling water instead of sand, which had formerly been used, and was apt to spoil the colour. After the solution of the indigo, the liquor may be weakened at pleasure; and any piece of cloth dipped in it will imbibe a dye deeper or lighter according to the quantity of colour it contains. This colour is very beautiful, but apt to prove unequal; and, as has been already said, extremely perishable. For the Saxon green it is necessary to have a yellow from indigo also, which is obtained by dissolving it in spirit of nitre. Mr Wolfe recommends an ounce and an half of powdered indigo to be mixed with two ounces of spirit of nitre diluted with four times its quantity of water. The mixture is then to stand for a week, and at the end of that space is to be digested in a sand heat for an hour or more; after which four ounces more of water are to be added. The solution, when filtered, will be of a fine yellow colour. Strong spirit of nitre, when mixed undiluted with indigo, is apt to set fire to it; for which reason the water is added. Even in its diluted state, it will froth and run over if the digestion be performed within 24 hours after the mixture; and on this account it is allowed to remain a week in the cold. One part of the solution of indigo in the acid of nitre, mixed with four or five parts of water, will dye silk or cloth of the palest yellow colour, or of any shade to the deepest, by letting them boil a longer or shorter time, adding water as the liquid evaporates. The addition of alum makes the colour more lasting. None of the colour separates in the operation but what is imbibed by the cloth, and therefore this liquid goes very far in dyeing. That part of the indigo which remains undissolved in the vitriolic acid, when collected by filtration and dissolved in spirit of nitre, will dye silk and wool of all shades of brown inclining to yellow.

96
M. de
Apligny's
remarks on
this process.

On the process for dyeing Saxon blue M. de Apligny observes, that there is no real solution of the indigo in the acid of vitriol, but that it is only divided into very fine particles and suspended in the liquor; neither can any alteration be made in it by an alteration in the process. Nor does this make any exception to the general rule in chemistry, that acids dissolve and redden the blue colouring matter of vegetables; it not being their nature to act upon feculæ such as indigo, but upon vegetable juices, the colour of which depends on the salts and essential oil of the plant. For the truth of his assertion he appeals to the appearance of the liquor prepared for dyeing Saxon blue.

97
Materials
for dyeing
less nume-
rous than
might be
supposed.

From the vast profusion of colours which nature exhibits in the flowers which grow every where around us, it is natural to think that the materials for dyeing might be had in the greatest plenty without any necessity of having recourse to foreign countries. But this is far from being the case: for scarce one of our blue or red flowers can be made to communicate any durable colour to cloth; while, on the other hand, almost all the yellow ones may be made to do so. Numberless experiments have been made to determine the plants

N^o 106.

which might be really useful to dyers; and most that have yet been found fit for their purpose in Britain are comprehended in the following list.

YELLOWS.

Bark of buckthorn,	<i>Rhamnus catharticus.</i>
berry-bearing alder,	— <i>frangula.</i>
berberry,	<i>Berberis vulgaris.</i>
plum-tree,	<i>Prunus domestica.</i>
apple-tree,	<i>Pyrus malus.</i>
hornbeam,	<i>Carpinus betulus.</i>
Root of meadow-rue,	<i>Thalictrum flavum.</i>
common nettle,	<i>Urtica dioica.</i>
Herb, saw-wort,	<i>Serratula tinctoria.</i>
bushy hawkweed,	<i>Hieracium umbellatum.</i>
hemp-agrimony,	<i>Bidens tripartita.</i>
gale, or Dutch myrtle,	<i>Myrica gale.</i>
sweet willow,	<i>Salix pentandra.</i>
birch-tree,	<i>Betula alba.</i>
hedge-nettle,	<i>Stachys sylvatica.</i>
spotted arsmart,	<i>Polygonum persicaria.</i>
yellow loosestrife,	<i>Lythymachia vulgaris.</i>
devil's-bit,	<i>Scabiosa succisa.</i>
kidney-vetch,	<i>Anthyllis vulneraria.</i>
common yellow liver-wort,	<i>Lichen parietinus.</i>
Flowers of St John's wort,	<i>Hypericum perforatum.</i>

REDS.

Roots of ladies bedstraw,	<i>Galium verum.</i>
herb woodroof,	<i>Asperula tinctoria.</i>
forrel,	<i>Rumex acetosa.</i>
tormentil,	<i>Tormentilla erecta.</i>
purple cinquefoil,	<i>Comarum palustre.</i>

PURPLES.

Herb, or tops of wild marjoram,	<i>Origanum sylvestre.</i>
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BLUES.

Bark of the ash,	<i>Fraxinus excelsior.</i>
Flowers of larkspur,	<i>Delphinium consolida.</i>
bell-flower,	<i>Campanula rotundifolia.</i>
Berries of black heath,	<i>Empetrum nigrum.</i>

GREENS.

Herb of ragwort,	<i>Senecio Jacobaea.</i>
cow-weed,	<i>Charophyllum sylvestre.</i>
Panicle of brome-grass,	<i>Bromus secalinus.</i>
common reed,	<i>Arundo phragmites.</i>

BLACKS.

Bark of oak,	<i>Quercus robur.</i>
Water horehound,	<i>Lycopus europaeus.</i>

As it is often necessary to give another colour to stuffs which have been already dyed, it is plain, that it is as necessary for a dyer to know how to discharge colours as how to make the cloth imbibe them.—Concerning this, it is only necessary to observe, that alkaline salts are in general the best, and, where the colours are well dyed, the only means of discharging them. If a piece of cloth is dyed with logwood, and the colour struck upon it with alum, that colour will be nearly discharged by oil of vitriol, or any other strong acid; but if solution of tin has been employed in striking the colour, acids have then no effect, and alkalies only can be employed. Neither will they discharge the colour totally, but the stuff must be bleached for some time to get out the remainder. If alkaline salts cannot be employed with safety to the stuff, it is then impossible to dye it any other colour than black; unless it be dyed

a compound colour, of which the original one is a component part.

98
Weight added to silk by different substances.

Concerning the weight that colours give to silk (in which it is most taken notice of, being sold by weight, and a commodity of great price), it is observed, that one pound of raw silk loseth four ounces by washing out the gums and the natural fordes; that the same scoured silk may be raised to above thirty ounces from the remaining twelve, if it be dyed black with some materials. Of all the materials used in dyeing, especially

of black, nothing increases weight so much as galls, by which black silks are restored to as much weight as they lost by washing out their gum; nor is it counted extraordinary, that blacks should gain about four or six ounces in the dyeing upon each pound. Next to the galls, old fustic increases the weight about $1\frac{1}{2}$ in 12; madder, one ounce; weld, half an ounce; the blue vats in deep blues of the fifth stall give no considerable weight; neither do logwood, cochineal, nor even copperas, where galls are not used.

D Y S

D Y S

Dyeing
||
Dysoepfy.

DYEING of Hats. See HATS.

DYEING of Leather. See LEATHER.

DYEING, or Staining, of paper, wood, bone, marble, &c. See BONE, MARBLE, PAPER, WOOD, &c.

DYNASTY, among ancient historians, signifies a race or succession of kings of the same line or family. Such were the dynasties of Egypt. The word is formed from the Greek *δυναστία* of *δυναστω*, to be powerful, or king.

The Egyptians reckon 30 dynasties within the space of 36,525 years; but the generality of chronologers look upon them as fabulous. And it is very certain, that these dynasties are not continually successive, but collateral.

DYRRACHIUM (anc. geog.), a town on the coast of Illyricum, before called *Epidamnus*, or *Epidamnus*, an inauspicious name, changed by the Romans to *Durrachium*; a name taken from the peninsula on which it stood. Originally built by the Corcyreans. A Roman colony (Pliny). A town famous in story: its port answered to that of Brundisium, and the passage between both was very ready and expeditious. It was also a very famous mart for the people living on the Adriatic; and the free admission of strangers contributed much to its increase: A contrast to the conduct of the Apollonians; who, in imitation of the Spartans, discouraged strangers from settling among them.

DYSÆ, in mythology, inferior goddesses among the Saxons, being the messengers of the great Woden, whose province it was to convey the souls of such as died in battle to his abode, called *Valhall*, i. e. the hall of slaughter; where they were to drink with him and their other gods *cerevisia*, or a kind of malt liquor, in the skulls of their enemies. The *Dysæ* conveyed those who died a natural death to *Hela*, the goddess of hell, where they were tormented with hunger, thirst, and every kind of evil.

DYSCRASY, among physicians, denotes an ill habit or state of the humours, as in the scurvy, jaundice, &c.

DYSENTERY, in medicine, a diarrhœa or flux, wherein the stools are mixed with blood, and the bowels miserably tormented with gripes. See MEDICINE-Index.

DYSENTERIC FEVER. *Ibid.*

DYSERT, a parliament town of Scotland, in the county of Fife, situated on the northern shore of the frith of Forth, about 11 miles north of Edinburgh.

DYSOREXY, among physicians, denotes a want of appetite, proceeding from a weakly stomach.

DYSPEPSY, a difficulty of digestion.

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DYSPNOEA, a difficulty of breathing, usually called *asthma*.

DYSURY, in medicine, a difficulty of making urine, attended with a sensation of heat and pain. See MEDICINE-Index.

DYTISCUS, WATER-BEETLE, in zoology, a genus of insects of the order of the coleoptera; the antennæ of which are slender and setaceous, and the hind feet are hairy, and formed for swimming. There are 23 species, distinguished by their antennæ, the colour of the elytra, &c.

The larvæ of the dytiscus are often met with in water. They are oblong, and have six scaly feet. Their body consists of eleven segments. The head is large, with four filiform antennæ and a strong pair of jaws. The last segments of their body have rows of hairs on the sides; and the abdomen is terminated by two spines charged with the like hairs, forming a kind of plumes. These larvæ are frequently of a greenish variegated brown: they are lively, active, and extremely voracious: they devour and feed upon other water-insects, and often tear and destroy each other. The perfect insect is little inferior to its larvæ in voraciousness, but it can only exercise its cruelty on the larvæ; the perfect insects, like himself, being sheltered by the kind of scaly cuirass with which they are armed. This creature must be touched cautiously; for besides its power of giving a severe gripe with its jaws, it has moreover, under the thorax, another weapon, a long sharp spine, which it will drive into one's fingers by the effort it makes to move backwards. The eggs of the dytisci are rather large, and are by them inclosed in a kind of silky dusky cod, of a strong and thick texture, in form round, and terminated by a long appendix or slender tail, of the same substance. These cods are often found in the water, and from them are brought forth the eggs and larvæ of the dytisci. The strength of these cods probably serves the insect to defend their eggs from the voraciousness of several other aquatic insects, and even from that of their fellow-dytisci, who would not spare them.

Many species of the perfect insect are common in stagnated waters, which they quit in the evening to fly about. They swim with incredible agility, making use of their hinder-legs after the fashion of oars. The elytra of the females are in general furrowed, and those of the male plain: when they first arrive at their perfect state, their elytra are almost transparent, and in many species of a beautiful dun colour, mingled with shades of greenish brown. The best method of

F f

catching

Dyspnoea
||
Dytiscus.

Plate
CLXIV.

Dyvour. catching them is with a hand-net or sieve; for they are so nimble, and exercise their defensive weapons so often, and with such painful success, to those who endeavour to catch them, that they are very often obliged to let them escape; the easiest way to kill them, is to let them fall into boiling hot water, which instantly destroys them.

DYVOUR, in Scots law; otherwise *Bare-man*: A

person who, being involved in debt, and unable to pay the same,—for avoiding imprisonment and other pains, makes cession of his effects in favour of his creditors; and does his *devoir* and duty to them, proclaiming himself bare man and indigent, and becoming debt-bound to them of all that he has. The word is used in the same sense as *BANKRUPT*: see that article; and *LAW* N° clxxxv, 11, 12. clxxii. 10, 11, 12, &c.

Dyvour.

E A C

E.

E A D

E,
Eachard.

E, THE second vowel, and fifth letter of the alphabet. The letter E is most evidently derived from the old character *𐤅* in the ancient Hebrew and Phœnician alphabets, inverted by the Greeks to this position E, and not from the Hebrew *He* 𐤠. From the same origin is also derived the Saxon *e*, which is the first letter in their alphabet that differs from the Latin one. It is formed by a narrower opening of the larynx than the letter A; but the other parts of the mouth are used nearly in the same manner as in that letter.

It has a long and short sound in most languages. The short sound is audible in *bed*, *fret*, *den*, and other words ending in consonants: its long sound is produced by a final *e*, or an *e* at the end of words; as in *glebe*, *here*, *hire*, *scene*, *sphere*, *interfere*, *revere*, *sincere*, &c. in most of which it sounds like *ee*; as also in some others by coming after *i*, as in *believe*, *chief*, *grief*, *reprieve*, &c. and sometimes this long sound is expressed by *ee*, as in *bleed*, *beer*, *creed*, &c. Sometimes the final *e* is silent, and only serves to lengthen the sound of the preceding vowel, as in *rag*, *rage*, *stag*, *stage*, *hug*, *huge*, &c. The sound of *e* is obscure in the following words, *oxen*, *heaven*, *bounden*, *fire*, *massacre*, *maugre*, &c.

The Greeks have their long and short *e* which they call *ephsilon* and *eta*. The French have at least six kinds of *e*'s: the Latins have likewise a long and short *e*; they also write *e* instead of *a*, as *dicem* for *dicam*, &c. and this is no doubt the reason why *a* is so often changed into *e* in the preter tense, as, *ago*, *egi*; *facio*, *fecî*, &c.

As a numeral, E stands for 250, according to the verse,

E, quoque ducentos et quinquaginta tenebit.

In music it denotes the tone *e-la-mi*. In the kalendar it is the fifth of the dominical letters. And in sea-charts it distinguishes all the easterly points: thus, E alone denotes East; and E. by S. and E. by N. East by South, and East by North.

EACHARD (John), an English divine of great learning and wit in the 17th century, bred at Cambridge, author (in 1670) of *The Grounds and Occasions of the Contempt of the Clergy and Religion inquired into*. In 1675 he was chosen master of Catharine-hall upon the decease of Dr John Lightfoot; and the year following was created D. D. by royal mandate. He died in 1696.

EACHARD (Laurence), an eminent English historian of the 18th century, nearly related to Dr John Eachard. He was the son of a clergyman, who, by the death of his elder brother, became master of a good estate in Suffolk. He was educated in the university of Cambridge, entered into holy orders, and was presented to the living of Welton and Elkington in Lincolnshire, where he spent above 20 years of his life, and distinguished himself by his writings, especially his *History of England*, which was attacked by Dr Edmund Calamy and by Mr John Oldmixon. His "*General Ecclesiastical History from the Nativity of Christ to the first Establishment of Christianity by Human Laws under the emperor Constantine the Great*," has passed through several editions. He was installed archdeacon of Stowe and prebend of Lincoln in 1712. He died in 1730.

EADMERUS, an esteemed historian, was an Englishman; but his parents, and the particular time and place of his nativity, are not known. He received a learned education, and very early discovered a taste for history, by recording every remarkable event that came to his knowledge. Being a monk in the cathedral of Canterbury, he had the happiness to become the bosom-friend and inseparable companion of two archbishops of that see, St Anselm and his successor Ralph. To the former of these he was appointed spiritual director by the Pope; and that prelate would do nothing without his permission. In the year 1120, he was sent for by king Alexander I. of Scotland, to be raised to the primacy of that kingdom; and having obtained leave of king Henry and the archbishop of Canterbury, he departed for Scotland, where he was kindly received by the king; and on the third day after his arrival, he was elected bishop of St Andrew's with much unanimity. But on the day after his election, an unhappy dispute arose between the king and him, in a private conference about his consecration. Eadmerus having been a constant companion of the late and of the present archbishops of Canterbury, was a violent stickler for the prerogatives of that see. He therefore told the king, that he was determined to be consecrated by none but the archbishop of Canterbury, who he believed to be the primate of all Britain. Alexander, who was a fierce prince,

Eachard,
Eadmerus.

Eagle.

prince, and supported the independency of his crown and kingdom with great spirit, was so much offended, that he broke off the conference in a violent passion, declaring, that the see of Canterbury had no pre-eminency over that of St Andrew's. This breach between the king and the bishop-elect became daily wider, till at length Eadmerus, despairing of recovering the royal favour, sent his pastoral ring to the king, and laid his pastoral staff on the high altar, from whence he had taken it, and abandoning his bishopric returned to England. He was kindly received by the archbishop and clergy of Canterbury, though they disapproved of his stiffness, and thought him too hasty in forsaking the honourable station to which he had been called. Nor was it long before Eadmerus became sensible of his error, and desirous of correcting it. With this view he wrote a long submissive letter to the king of Scotland, intreating his leave to return to his bishopric, promising compliance with his royal pleasure in every thing respecting his consecration, which was accompanied by an epistle to the same purpose from the archbishop. These letters, however, which were written A. D. 1122, did not produce the desired effect. But Eadmerus is most worthy of the grateful remembrance of posterity for his historical works, particularly for his excellent history of the affairs of England in his own time, from A. D. 1066 to A. D. 1122; in which he hath inserted many original papers, and preserved many important facts, that are no where else to be found. This work hath been highly commended, both by ancient and modern writers, for its authenticity, as well as for regularity of composition and purity of style. It is indeed more free from legendary tales than any other work of this period; and it is impossible to peruse it with attention, without conceiving a favourable opinion of the learning, good sense, sincerity, and candour of its author.

EAGLE, in ornithology. See FALCO.

EAGLE, in heraldry, is accounted one of the most noble bearings in armoury; and, according to the learned in this science, ought to be given to none but such as greatly excel in the virtues of generosity and courage, or for having done singular services to their sovereigns; in which cases they may be allowed a whole eagle, or an eagle naissant, or only the head or other parts thereof, as may be most agreeable to their exploits.

The eagle has been borne, by way of ensign or standard, by several nations. The first who seem to have assumed the eagle are the Persians; according to the testimony of Xenophon. Afterwards, it was taken by the Romans; who, after a great variety of standards, at length fixed on the eagle, in the second year of the consulate of C. Marius: till that time, they used indifferently wolves, leopards, and eagles, according to the humour of the commander.

The Roman eagles, it must be observed, were not painted on a cloth or flag; but were figures in relief, of silver or gold, borne on the tops of pikes; the wings being displayed, and frequently a thunder-bolt in their talons. Under the eagle on the pike, were piled bucklers, and sometimes crowns. Thus much we learn from the medals.

Constantine is said to have first introduced the eagle

with two heads, to intimate, that though the empire seemed divided, it was yet only one body. Others say, that it was Charlemagne who resumed the eagle as the Roman ensign, and added to it a second head; but that opinion is destroyed, by an eagle with two heads, noted by Lipsius, on the Antonine column; as also by the eagle's only having one head on the seal of the golden bull of the emperor Charles IV. The conjecture, therefore, of F. Menestrier appears more probable, who maintains, that as the emperors of the east, when there were two on the throne at the same time, struck their coins with the impression of a cross, with a double traverse, which each of them held in one hand, as being the symbol of the Christians; the like they did with the eagle in their ensigns; and instead of doubling their eagles, they joined them together, and represented them with two heads. In which they were followed by the emperors of the West.

F. Papebroche wishes that this conjecture of Menestrier were confirmed by ancient coins; without which, he rather inclines to think the use of the eagle with two heads to be merely arbitrary; though he grants it probable, that it was first introduced on occasion of two emperors in the same throne.

The eagle on medals, according to M. Spanheim, is a symbol of divinity and providence; and, according to all other antiquities, of empire. The princes on whose medals it is most usually found, are the Ptolemies and the Seleucides of Syria. An eagle with the word CONSECratio, expresses the apotheosis of an emperor.

EAGLES, a name found very frequently in the ancient histories of Ireland, and used to express a sort of base money that was current in that kingdom in the first years of the reign of Edward I. that is, about the year 1272. There were, besides the eagles, lions, roses, and many other coins of the same sort, named according to the figures they were impressed with.

The current coin of the kingdom was at that time a composition of copper and silver, in a determined proportion, but these were so much worse than the standard proportion of that time, that they were not intrinsically worth quite half so much as the others. They were imported out of France and other foreign countries. When this prince had been a few years established on the throne, he set up mints in Ireland for the coining sufficient quantities of good money, and then decried the use of these eagles, and other the like kinds of base coins, and made it death, with confiscation of effects, to import any more of them into the kingdom.

EAGLE, in astronomy, is a constellation of the northern hemisphere, having its right wing contiguous to the equinoctial. See AQUILA.

There are also three several stars, particularly denominated among the Arab astronomers, *nafr*, i. e. "eagle." The first, *nafr sobail*, the "eagle of canopus," called also *sitareh jemen*, the star of Arabia Felix, over which it is supposed to preside; the second, *nafr althair*, the "flying eagle;" and the third, *nafr alwake*, the "resting eagle."

White EAGLE, is a Polish order of knighthood, instituted in 1325 by Uladislaus V. on marrying his son

Eagle.

Eagle
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Ear.

Casimire with a daughter of the great-duke of Lithuania.

The knights of this order were distinguished by a gold chain, which they wore on the stomach, whereon hung a silver eagle crowned.

Black EAGLE, was a like order, instituted in 1701 by the elector of Brandenburg, on his being crowned king of Prussia.

The knights of this order wear an orange-coloured ribbon, to which is suspended a black eagle.

EAGLE, in architecture, is a figure of that bird anciently used as an attribute, or cognizance of Jupiter, in the capital and friezes of the columns of temples consecrated to that god.

EAGLE-flower. See *BALSAMINE*.

EAGLE-stone, in natural history, a stone, by the Greeks called *etites*, and by the Italians *pietra d'aquila*, as being supposed to be sometimes found in the eagle's nest. It is of famous traditionary virtue, either for forwarding or preventing the delivery of women in labour, according as it is applied above or below the womb. Matthiolus tells us, that birds of prey could never hatch their young without it, and that they go in search for it as far as the East Indies. Bausch has an express Latin treatise on the subject. See *ÆTITES*.

EAGLET, a diminutive of eagle, properly signifying a young eagle. In heraldry, when there are several eagles on the same escutcheon, they are termed *eaglets*.

EALDERMAN, or *EALDORMAN*, among the Saxons, was of like import with earl among the Danes.

The word was also used for an elder, senator, or statesman. Hence, at this day, we call those *aldermen* who are associates to the chief officer in the common-council of a city or corporate town.

EAR, in anatomy. See there, n° 141.

Several naturalists and physicians have held, that cutting off the ear rendered persons barren and unprolific; and this idle notion was what first occasioned the legislators to order the ears of thieves, &c. to be cut off, lest they should produce their like.

The ear has its beauties, which a good painter ought by no means to disregard; where it is well formed, it would be an injury to the head to be hidden. Suetonius insists, particularly, on the beauties of Augustus's ears; and Ælian, describing the beauties of Aspasia, observes, she had short ears. Martial also ranks large ears among the number of deformities.

Among the Athenians, it was a mark of nobility to have the ears bored or perforated. And among the Hebrews and Romans, this was a mark of servitude.

Loss of one ear is a punishment enacted by 5 and 6 Edw. VI. cap. 4. for fighting in a church-yard; and by 2 and 3 Edw. VI. cap. 15. for combinations to raise the price of provisions, labour, &c. if it be the third offence, beside pillory, and perpetual infamy, or a fine of 40*l*.

By a statute of Henry VIII. maliciously cutting off the ear of a person is made a trespass, for which treble damages shall be recovered; and the offender is to pay a fine of ten pounds to the king.

37 Hen. VIII. cap. 6. § 4. In the index to the Statutes at Large, it is said, that this offence may be punished as felony, by 22 and 23 Car. II. cap. 1. § 7. commonly called *Coventry's act*; but ear is not mentioned in that statute.

EAR of Fishes. See *COMPARATIVE Anatomy*, n° 167.

EAR, in music, denotes a kind of internal sense, whereby we perceive and judge of harmony and musical sounds. See *MUSIC*.

In music we seem universally to acknowledge something like a distinct sense from the external one of hearing; and call it a *good ear*. And the like distinction we should probably acknowledge in other affairs, had we got distinct names to denote these powers of perception by. Thus a greater capacity of perceiving the beauties of painting, architecture, &c. is called a *fine taste*.

EAR is also used to signify a long cluster of flowers, or seeds, produced by certain plants; usually called by botanists *spica*. The flowers and seeds of wheat, rye, barley, &c. grow in ears. The same holds of the flowers of lavender, &c. We say the stem of the ear, i. e. its tube or straw; the knot of the ear; the lobes or cells wherein the grains are inclosed; the beard of the ear, &c.

EAR-Ach. See (the *Index* subjoined to) *MEDICINE*.

EAR-Pick, an instrument of ivory, silver, or other metal, somewhat in form of a probe, for cleansing the ear. The Chinese have a variety of these instruments, with which they are mighty fond of tickling their ears; but this practice, Sir Hans Sloane observes, must be very prejudicial to so delicate an organ, by bringing too great a flow of humours on it.

EAR-Ring. See *PENDENT*.

EAR-Wax. See *CERUMEN*, and *ANATOMY*, p. 764, col. 1.

EARWIG, in zoology. See *FORFICULA*.

EARING, in the sea-language, is that part of the bolt-rope which at the four corners of the sail is left open, in the shape of a ring. The two uppermost parts are put over the ends of the yard-arms, and so the sail is made fast to the yard; and into the lowermost earings, the sheets and tacks are seized or bent at the clew.

EARL, a British title of nobility, next below a marquis, and above a viscount.

The title is so ancient, that its original cannot be clearly traced out. This much, however, seems tolerably certain, that among the Saxons they were called *ealdormen*, quasi elder men, signifying the same with *senior* or *senator* among the Romans; and also *schiremen*, because they had each of them the civil government of a several division or shire. On the irruption of the Danes they changed their names to *eorels*, which, according to Camden, signified the same in their language. In Latin they are called *comites* (a title first used in the empire), from being the king's attendants; *a societate nomen sumpserunt, regis enim tales sibi associant*. After the Norman conquest they were for some time called *counts*, or *countees*, from the French; but they did not long retain that name themselves, though their shires are from thence called *counties* to this day. It is now become a mere title: they have nothing to do with the government of the county; which is now en-

Ear
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Earl.

Earl
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Earth.

tirely devolved on the sheriff, the earl's deputy, or *vicecomes*. In writs, commissions, and other formal instruments, the king, when he mentions any peer of the degree of an earl, usually styles him "trusty and well-beloved *cousin*:" an appellation as ancient as the reign of Henry IV.; who being either by his wife, his mother, or his sisters, actually related or allied to every earl in the kingdom, artfully and constantly acknowledged that connection in all his letters and other public acts; whence the usage has descended to his successors, though the reason has long ago failed.

An earl is created by cincture of sword, mantle of state put upon him by the king himself, a cap and a coronet put upon his head, and a charter in his hand.

EARL-Marshal. See MARSHAL.

EARNEST (*ARRHÆ*), money advanced to bind the parties to the performance of a verbal bargain. By the civil law, he who recedes from his bargain loses his earnest, and if the person who received the earnest give back, he is to return the earnest double. But with us, the person who gave it, is in strictness obliged to abide by his bargain; and in case he decline it, is not discharged upon forfeiting his earnest, but may be sued for the whole money stipulated.

EARTH, among ancient philosophers, one of the four elements of which the whole system of nature was thought to be composed. See ELEMENT.

EARTHS, in chemistry, are defined by Cronstedt to be such substances as are not ductile, mostly indissoluble in water or oil, and that preserve their constitution in a strong heat. Mr Bergman remarks that they are insipid, and not soluble in 1000 times their weight of boiling water; though, by augmenting the heat as in Papin's digester, perhaps all the kinds we are yet acquainted with may be found capable of solution, especially when precipitated from some other menstruum; their surface being then greatly augmented. In the chain of nature they proceed by an insensible gradation towards the salts, so that they cannot be separated but by artificial limits. A moderate heat does not change their form, nor are they dissipated by a more violent one. Dr Black defines them to be such bodies as are not soluble in water, not inflammable, and their specific gravity not more than four times the weight of water. They are distinguished from the salts by their insolubility; from the inflammables, by their want of inflammability; and from the metals, by their deficiency in weight. Some objections have been made to this definition, as not being strictly applicable to those earths which are known to be soluble in water: but this objection may be accounted of little weight, when we consider the extreme disparity betwixt the solubility of the earths and salts, a few grains of the earths saturating some pounds of water; so that if they have any solubility, they must be allowed to possess but a very small share of it.

Another property, which is not usually taken into the definition, makes nevertheless a remarkable part of the character of earthy bodies, viz. their great fixedness in the fire. All the other classes of bodies show themselves volatile in more or less violent degrees of heat. All the salts can be made to evaporate; all the inflammable substances are volatile; all the metals,

gold not excepted, have been converted into vapour; but the earths, as far as we know, have never been volatilized, excepting only two, the diamond and asbestos. Some phenomena attending the volatilization of the diamond give reason to suspect that it is not a pure earthy substance. There is an appearance of inflammation; and it seems to be a compound, having an earthy matter for its basis, and deriving its volatility from other matters. In general therefore, the earths have been found fixed in any degree of heat of which we have had experience; though there is no doubt a possibility, that heat might be raised to such an intensity as to volatilize the most fixed body in nature; but till the means of doing so shall be found out, the earths may be considered as absolutely fixed.

The earths called *primitive* or *simple*, because they cannot be decomposed by any method hitherto known, were by Cronstedt supposed to be nine; but later chemists have reduced them to five. Some reduce the number still farther; but Mr Bergman informs us that these "rest their opinions upon fanciful metamorphoses unsupported by faithful experiments. As experiments teach us that there are five primitive earths, it is evident that the species arising from their mixture cannot exceed 24, viz. ten double, consisting of two earths; six triple, three quadruple, and the five primitive earths. Even all these different mixtures have not been found, though they probably do exist in nature. The natural compositions of acids with the earths, forming substances not soluble in 1000 times their weight of boiling water, and which may be called *saline earths*, are undoubtedly chemical combinations. The five primitive earths are, terra ponderosa; calx or calcareous earth, capable of being reduced into quicklime; magnesia; argilla or argillaceous earth; and siliceous earths.

"But though we must consider these as the most pure of all the earthy bodies, they are never found native in a state of absolute purity; nor indeed can they be made perfectly pure even by artificial means. Water and aerial acid unite readily with the four first; and when expelled by fire, a little of the matter of heat is added, until driven out by a more powerful attraction. But in this state they possess a degree of purity not to be attained by any other known method. Therefore it is necessary to examine them when sufficiently burnt, in order to distinguish better what properties depend upon adhering heterogeneous matters."

Our author at first added the earth of gems to the five classes already mentioned; but he found afterwards that all kinds of gems are compounded of some of the five kinds already mentioned, particularly of the argillaceous kind, inasmuch that they may be said almost entirely to belong to this class. Still, however, the earth of diamonds seems to possess properties essentially distinct from the five already mentioned, and therefore may not unjustly be reckoned a sixth class, though its characters have as yet been but very imperfectly examined.

1. *Terra Ponderosa*. This was discovered in Sweden about the year 1774, and is found in several different forms.

1. Combined with aerial acid, called by Dr Withering *terra ponderosa aerata*. This substance has been met.

Earth.

Earth. met with in England; and an account of it, with Dr Withering's analysis, is given under the article CHEMISTRY.

2. The spar-like gypsum, marmor metallicum, lapis bononiensis, phosphorus nativus, baro-selenite, &c. is of very considerable specific gravity, approaching to that of tin or iron; on which account it has been supposed to contain something metallic. But no experiments hitherto made have evinced the existence of any metal in it, excepting a few traces of iron, which are to be met with in all the gypsa. It is met with of two kinds, semitransparent and opaque; the latter being either of a white or reddish colour. The specific gravity is about 4,500, water being accounted 1000. It contains about 84 parts of ponderous earth, 13 of the most concentrated vitriolic acid, and three of water. The method of preparing the phosphorus from this substance is mentioned under the article CHEMISTRY; but Cronstedt observes, that the phosphorescent quality of these stones is different from that of the sparry fluors and limestones, which is only produced by their being slowly heated, and seems to arise from a phlogiston which is destroyed by a glowing heat. M. Scheffer, in the Stockholm Memoirs for 1753, relates some experiments on a stone of this kind from China, which show that it is exactly the same with the *petuntse* of that country, an ingredient in their porcelain manufactories. This stone does not burn into plaster as gypsum does, and is infusible by itself. It frequently contains calcareous earth, and sometimes is met with in the ores of metals, and it likewise forms the basis of some petrifications. Sometimes it contains one or two parts of iron in the hundred.

3. The marmor metallicum drusicum, or ponderous drusen spar, is found in the lead-mines at Alston-moor in Cumberland, regularly crystallized in the form of alum, solid, and semitransparent. M. Magellan says that he was showed some fine specimens of this mineral by a Mr Thomson, who informed him that "it seems to affect the peculiarity of having its crystals laminated, as radiating from a centre; but that this radiation seldom amounts to a whole circle. The corners of these flat crystals are truncated like those of alum, and thicker on one side than the other of the parallelogram, in such a manner as to fit one another in the kind of arched vault which they form together, and have some small ones adhering to their sides like drusen spars, having internal angles, as the *maeles* of the French, or the cruciform crystallizations." The specific gravity of these crystals were found by Mr Nicholson, with an instrument of his own invention, to be to water as 44,745 to 10,000. This species of crystals is found in Auvergne in France, and has been described by Mr Bayen, who supposed its basis to be calcareous. It was extremely refractory, and the surface of its crystals covered with ferruginous ochre. A variety of this is found jagged like cocks combs. This is met with in cliffs and fissures, accreted on the surfaces of balls of the same substance. In Derbyshire this substance is called *cauk* or *calk*. M. Magellan was showed some specimens of it by Mr Whitehurst, which had not only convex but flat surfaces. Those of the upper aggregated parts were rather like the edges

of very thin flattish lenses put together, than like Earth. cocks combs. Varieties of it are also found of white and reddish colours. It is likewise met with of a fibrous texture in the form of zeolite or asbestos in filaments. M. Monnet is of opinion that these spars sometimes contain phlogiston, having observed that they become a liver of sulphur in a strong heat; but Mr Woulfe is of opinion that this gentleman was deceived by charcoal falling into his crucible.

4. The lapis hepaticus, or leberstein of the Germans and Swedes. Some specimens of this stone constantly smell like liver of sulphur, but others only when rubbed. It does not effervesce with acids, and according to M. Magellan is a medium between the gypsum and fetid calcareous stones with which it has generally been confounded; but it will not yield any lime, though the latter are more fit for the purpose than any other. Mr Kirwan informs us that this stone is generally compact, but not hard enough to strike fire; its texture is either equable or laminar, scaly or sparry; and it takes a polish like alabaster, does not effervesce with acids, and when calcined is partially reduced to a kind of plaster of Paris. According to the analysis of this stone given us by Professor Bergman, 100 parts of it contain 33 of baro-selenite, 38 of siliceous earth, 22 of alum, seven of gypsum, and five of mineral oil. Cronstedt denies that these stones contain any volatile alkali, though his assertion is contradicted by Wallerius, who affirms, that a volatile alkali certainly exists in them, and may be discovered by a chemical analysis. "The method which nature takes to combine the ingredients of the lapis hepaticus (says Cronstedt), may be perhaps the same as when a limestone is laid in an heap of mundic while it is roasting; because there the sulphur unites itself with the limestone, whereby the latter acquires the smell of liver of sulphur, instead of which the vitriolic acid alone enters the composition of gypsum. How the sulphur combines itself may likewise be observed in the slate-balls or kernels from the Andrarum alum mines to be afterwards mentioned, where it sometimes combines with a martial earth with which this slate abounds, and with it forms pyrites within the very slate-balls. The fetid or swine stones, as well as the liver-stones, are, with regard to the structure of their parts, subject to the same varieties with the other kinds of limestones." This kind of stone is found, 1. Scaly, of which there are two varieties; one having coarse scales, the other of a whitish yellow colour. 2. With fine glittering scales. This is met with of a black colour at Andrarum in Sweden, in the alum slate above mentioned. Bergman says that this kind consists of a ponderous earth combined with vitriolic acid, mixed with a rock oil, and with the calcareous, argillaceous, and siliceous earths. He adds, that by a chemical analysis one of these kernels gave 29 parts of caustic ponderous earth, 33 of siliceous, almost 5 of the argillaceous, and 3.7 of lime, besides the water and vitriolic acid which entered its composition.

II. *Calcareous Earths*, when freed from impurities as far as possible, have the following properties. 1. They become friable when burnt in the fire. 2. They more readily fall into powder by being thrown into water, or having it thrown upon them after calcination. 3. They cannot be melted by themselves into glass in close

Earth.

Earth.

close vessels. 4. They augment the causticity of alkaline salts by being mixed with them after burning. 5. They exhibit different phenomena in combination with the different acids. With the vitriolic they precipitate in the form of a gypseous earth capable of shooting, by proper management, into selenitic crystals. With marine acid they form a deliquescent mass called *fixed sal ammoniac*, and which forms a kind of phosphorus. With nitrous acid they combine into a glutinous deliquescent mass, from which the acid may be partly driven off by fire; in which operation part of the earth itself is volatilized, and which, in a certain state of calcination, produces Baldwin's phosphorus. With the fluor acid they regenerate the spar from which this acid was procured. With phosphoric acid they are said to regenerate the earth of bones; though the experiments by which this is said to be proved are, as we have often had occasion to observe, by no means conclusive. With the acid of vinegar they crystallize into neutral salts, which do not deliquesce in the air. 6. With borax they readily melt into a kind of glass which takes impressions in a degree of heat below ignition. 7. With the microcosmic acid they likewise melt into glass with effervescence; a circumstance likewise observable when borax is made use of; and both these glasses are quite colourless and transparent while hot, but become opaque as soon as they cool; but if the bead is thrown whilst hot into melted tallow, or even into warm water or any other hot liquor, it preserves its transparency. 8. With flus-spat they melt more readily than with any other into a kind of slag, by which crucibles are corroded. This, however, according to M. Magellan, is entirely to be attributed to the solvents. 9. In certain cases they are likewise found capable of reducing some metallic calces, as those of lead and bismuth; sometimes also those of iron and copper are affected, though in a less degree. But on this Mr Kirwan remarks, that such reductions take place only when the earth is combined with aerial acid; and that though calces of lead are in some measure reduced by chalk, they are not in the least affected by lime; which evidently proves that they receive phlogiston from fixed air, which is a compound of phlogiston and dephlogisticated air. 10. In this last instance, as well as in some others, they resemble alkaline salts; whence they frequently take the title of alkaline earths. Mr Bergman observes, that as calcareous earth united to the aerial acid is found native, very little trouble is necessary to procure it in a state of purity. For this purpose nothing more is requisite than to boil selected pieces of chalk repeatedly in pure water, which dissolves any calcined earth or *magnesia salita* that may be contained in it; after which operation it has no heterogeneous matter but what mechanically adheres to it, the quantity of which is generally extremely small; and if we likewise desire to have it absolutely free of this, we must dissolve it in vinegar, precipitate it with mild volatile alkali, and dry it after carefully washing the precipitate. The specific gravity of the precipitate thus carefully washed and dried is about 2.720. An hundred parts of it contain about 34 of aerial acid, 11 of water, and 54 of pure earth. Acids unite with it with effervescence, and the mixture produces heat. When burnt it loses $\frac{1}{8}$ of its weight;

and in this state dissolves in 700 times its weight of water, producing heat at the same time. If acids are poured upon it when in a calcined state, a great degree of heat is produced; insomuch that unless part of it be abstracted by previously mixing the earth with water, the mixture will be made to boil. The pouring of water upon calcined earth of this kind likewise expels the atmospheric air from its pores. In this case, if nitrous or muriatic acid be added, no effervescence will ensue; the solution will proceed slowly, but the saturation becomes at length as perfect as if the earth had not been calcined. By this burnt earth the acid is expelled from sal ammoniac, sulphur is dissolved, and other remarkable effects performed, of which an account is given under the articles CHEMISTRY, DYEING, CEMENT, MORTAR, &c.

The calcareous earth, according to Cronstedt, is common to all the three kingdoms of nature; existing in the shells and bones of animals, the ashes of vegetables; and consequently, says he, it must have existed before any living or vegetable substance, and is no doubt distributed throughout the earth in a quantity proportioned to its general use.

The forms in which calcareous earth is ever met with are the shells of animals, chalk, limestone, and marble; for an account of which see these different articles. Its uses as a manure, and in building, are detailed under the articles CEMENT and AGRICULTURE. Messrs Sage, Rome de L'Isle, &c. have supposed the existence of a kind of earth called *absorbent*, distinct from the calcareous; but M. Monnet has shown this to be truly calcareous.

III. *Magnesia*, called also *terra muriatica*, or *magnesia alba*. The nature and properties of this earth are described under the article MAGNESIA. It is found,

1. Combined with the vitriolic acid in the form of a bitter salt called Epsom or Sedlitz salt. This is found in great plenty in the liquor which remains after the crystallization of sea-salt.

2. With the marine acid; in which case it forms a salt likewise crystallizable, but of a very hot burning taste, and emitting vapours of spirit of salt by distillation. This is known by the name of *magnesia salita*, and is likewise found in plenty in the liquor above mentioned.

3. It is contained also in fresh waters, where it is dissolved by the aerial acid.

4. Combined with the siliceous earth. This is commonly unctuous to the touch, and of different degrees of hardness, incapable of being diffused in water, and growing hard and very refractory in the fire. It is met with in various parts of the world, particularly in the east, and is the substance of which the large Turkey tobacco-pipes are made. It is also called *French chalk*, and is met with in England about the Land's End of Cornwall, of a yellow colour, or red and white like Castile soap. It consists, according to Mr Wiegleb, of equal parts of magnesia and siliceous earth. A mixture of this with calcareous earth and iron is found near Thionville in the French part of Luxembourg. It is of a blue colour, and contains the greatest proportion of calcareous earth, with some clay and petrified matters. Another of an olive colour is found in the same place; but has no argillaceous earth in it, though they both

Earth.

both look like clay, and the last is used in pottery. A mixture of this earth with clay, talc, and iron, is found in Silesia. It is of a greenish yellow, is of a loose form and greasy feel. According to Mr Margraaff it contains one-third of magnesia.

5. In steatites or soap-rock. See STEATITES.

6. In serpentine stone. See SERPENTINE.

IV. *Argillaceous Earths*. See CLAY.

V. *Siliceous Earths*. See CHEMISTRY, FLINT, GEMS, DIAMOND, EMERALD, SAPPHIRE, &c. also CHEMISTRY, n° 829, 847, 1074, and 1076.

EARTH, in astronomy and geography, one of the primary planets; being this terraqueous globe which we inhabit.

1
Different
opinions
respecting
the cosmo-
gony.

The cosmogony, or knowledge of the original formation of the earth, the materials of which it was composed, and by what means they were disposed in the order in which we see them at present, is a subject which, though perhaps above the reach of human sagacity, has exercised the wit of philosophers in all ages. To recount the opinions of all the eminent philosophers of antiquity upon this subject would be very tedious: it may therefore suffice to observe, that, ever since the subject began to be canvassed, the opinions of those who have treated it may be divided into two classes. 1. Those who believed the earth and whole visible system of nature to be the Deity himself, or connected with him in the same manner that a human body is with its soul. 2. Those who believed the materials of it to have been eternal, but distinct from the Deity, and put into the present order by some power either inherent in themselves or belonging to the Deity. Of the former opinion were Zenophanes the founder of the *eleatic* sect, Strato of Lampascus, the Peripatetics, &c.

The second opinion, namely, that the substance of the earth or universe (for it is impossible to speak of the one without the other) was eternal, though not the form, was most generally held among the ancients. From that established axiom, that "nothing can be produced from nothing," they concluded that creation was an impossibility; but at the same time they thought they had good reason to believe the world had not been always in its present form. They who held this opinion may again be divided into two classes: first, those who endeavoured to account for the generation of the world, or its reduction into the present form, by principles merely mechanical, without having recourse to any assistance from divine power; and, secondly, those who introduced an intelligent mind as the author and disposer of all things. To the first of these classes belonged the cosmogony of the Babylonians, Phœnicians, and Egyptians; the particulars of which are too absurd to deserve notice. Of the same opinion also were most of the poets; the philosophers Thales, Anaximander, Anaximenes, Anaxagoras, &c. The latter attempted to reform the philosophy of his master Anaximenes by introducing an intelligent principle into the world distinct from matter; thus making his intelligent principle, or God, the soul of the world. Diogenes of Apollonia supposed air, which he made the first principle of all things, to be endued with reason: His manner of philosophizing differed very little from that of Des Cartes. "All things (says he) being in

N° 106.

motion, some became condensed and others rarefied. In those places where condensation prevailed, a whirling motion or vortex was formed; which by its revolution drew in the rest, and the lighter parts flying upwards formed the sun."

The most remarkable of the atheistic systems, however, was the atomic one, supposed to have been invented by Democritus; though Laertius attributes it to Leucippus, and some make it much older. According to this system, the first principles of all things were an infinite multitude of atoms, or indivisible particles of different sizes and figures; which, moving fortuitously, or without design, from all eternity, in infinite space, and encountering with one another, became variously entangled during their conflict. This first produced a confused chaos of all kinds of particles; which afterwards, by continual agitation, striking and repelling each other, disposed themselves into a vortex or vortices, where, after innumerable revolutions and motions in all possible directions, they at last settled into their present order.

The hypothesis of Democritus agrees in the main with that of Epicurus as represented by Lucretius; excepting that no mention is made of those vortices, which yet were an essential part of the former. To the two properties of magnitude and figure which Democritus attributed to his atoms, Epicurus added a third, namely, weight; and, without this, he did not imagine they could move at all. The system of Democritus necessarily introduced absolute fatal necessity; which Epicurus not choosing to agree to, he invented a third motion of the atoms, unknown to those who had gone before him. His predecessors allowed them to have a perpendicular and reflexive motion: but Epicurus, though he allowed these motions to be absolutely necessary and unavoidable, asserted that the atoms could also of themselves decline from the right line: and from this declination of the atoms he explained the free will of man.—The most material difference between the two systems, however, was, that Epicurus admitted no principle but the atoms themselves; whereas Democritus believed them to be animated.

Of those who held two distinct and coeternal principles, viz. God and Matter, we shall only take notice of the opinions of Pythagoras, Plato, and Aristotle, as being the most remarkable.

Pythagoras is said to have asserted two substantial self-existent principles: a *monad*, or unity; and a *dyad*, or duality. The meaning of these terms is now somewhat uncertain. Some think, that by the monad he meant the Deity, and by the dyad matter. Others think, that the Pythagoric monads were atoms. The dyad is sometimes thought to signify a demon or evil principle; but Porphyry's interpretation, which seems the most probable, is as follows. The cause, says he, of that sympathy, harmony, and agreement which is in things, and of the conservation of the whole, which is always the same and like itself, was by Pythagoras called *unity*; that unity which is in the things themselves being but a participation of the first cause: but the reason of difference, inequality, and constant irregularity in things, was by him called a *dyad*. This philosopher held *numbers* to be the principles

Earth.

2
Systems of
Democritus
and Epicu-
rus.

3
Of Pytha-
goras, Pla-
to, and
Aristotle.

Earth.

ciples of all things; and from them he accounted for the production of the world in the following manner. He supposed that the monad and dyad were the two sources of numbers, from whence proceeded points; from points, lines; from lines, plane figures; from planes, solids: from solids, sensible bodies. The elements of sensible bodies are four; but, besides these, there was a fifth (never yet discovered). The four elements which manifest themselves to our senses are, fire, air, earth, and water. These are in a perpetual change, and from them the world was formed; which is animated, intelligent, and spherical; containing, in the midst of it, the earth, a globe and inhabited body. The world, he said, began from fire and the fifth element; and that as there were five figures of solid bodies, called mathematical or regular, the earth was made of the cube, fire of the pyramid or tetrahedron, the air of the octahedron, water of the icosaedron, and the sphere of the universe of the dodecahedron.—This method of philosophizing, which has no manner of foundation in nature, was adopted by Plato and Aristotle; and hence proceeded all the absurdities concerning ideas, forms, qualities, &c. with which the Aristotelian philosophy was loaded.

For a long time, however, the philosophy of Aristotle prevailed, and the world was thought to be upheld by forms, qualities, and other unintelligible and imaginary beings.—At last the French philosopher Des Cartes superseded the Aristotelian, by introducing the atomic or Democritic, and Epicurean philosophy*. The Cartesian system was quickly superseded by the Newtonian; which still continues, though considerably different from what it was left by that great man.—His opinions, indeed, concerning the cosmogony seem to have been in a fluctuating state; and hence he delivers himself in such a manner, that he hath often incurred the charge of contradicting himself.—He maintained, for instance, that matter was infinitely divisible; and the mathematical demonstrations of this proposition are well known. Notwithstanding this, however, when he comes particularly to speak of the original construction of the world, he seems to retract this opinion, and adopt the atomic philosophy. He tells us, that it seems probable, that in the beginning God formed matter in *solid, massy, impenetrable* particles, &c.†; and that of these particles, endowed with various powers of attraction and repulsion, the present system of nature is formed. His primary laws of nature are only three in number, and very simple. The first is, that all matter has a tendency to continue in that state in which it is once placed, whether of rest or motion. If it is at rest, for example, it will continue at rest for ever, without beginning motion of itself; but if it is once set in motion by any cause whatever, it will for ever continue to move in a right line, until something either stops it altogether, or forces it to move in another direction. 2. That the change of motion is always equivalent to the moving force employed to produce it, and in the direction of the right line in which it is impressed; that is, if a certain force produces a certain motion, double that force will produce double that motion, &c. 3. Reaction is always contrary and equal to action; or the actions of two bodies upon one another are always equal and contrary to one another.

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From these three laws, together with the two contrary forces of attraction and repulsion, Sir Isaac Newton and his followers have attempted to explain all the phenomena of nature. When they come to explain the nature of the attractive and repulsive forces, however, they are exceedingly embarrassed. Sir Isaac hath expressed himself in two different ways concerning them. In his Principia, he pretty positively determines them to be owing to a cause that is not material; and in his Queries, he supposes they may be effects of some subtile matter which he calls *ether*. This disagreement with himself hath produced no small disagreement among his followers. One party, laying hold of his assertions in the Principia, determine the world to be upheld by *immaterial* powers; while the other, neglecting the Principia, and taking notice only of the Queries at the end of the Optics, strenuously maintain, that attraction and repulsion are owing to the action of some exceedingly fine and subtile ether.—The first of these suppositions, it is argued, necessarily involves us in one of the following dilemmas. 1. If the attractive and repulsive forces are not material, they must either be occasioned by spiritual beings, or they must be *qualities* of matter. If they are occasioned by the action of immaterial beings, these beings must either be created or uncreated. If they are produced by the action of created beings, we run into the supposition of some of the ancient heathens, that the world is governed by demons or subordinate intelligences; and thus may make an easy transition to polytheism. If attraction and repulsion are the immediate action of the Deity himself, we run into the doctrine of making God the soul of the world.—This last hypothesis hath been most strenuously adopted by Mr Baxter in his treatise of the Immateriality of the human Soul. Mr Boscovich, Mr Mitchel, and Dr Priestley, have likewise adopted the hypothesis of immaterial powers to such a degree, that, according to them, the whole world consists of nothing else but *attractions* and *repulsions* surrounding *physical points*‡. 2. If we suppose the attractive and repulsive powers to be only *properties, qualities, or laws*, impressed on matter by the Deity, we might as well have been contented with the occult qualities of Aristotle.—If attraction and repulsion are occasioned by the action of mere matter, and all the powers in nature are only material, the charge is incurred of making nature direct itself in such a manner, that there is no occasion for the interposition, or even the existence, of a Deity at all.

Thus we see, the Newtonian cosmogony must incline either to the Platonic and Aristotelian, or to the Atomic or Epicurean; according to the hypothesis we lay down concerning the nature of attraction. Des Cartes's system was plainly a revival of that of Democritus and Epicurus, with some corrections and improvements. It was farther improved and corrected by Mr Hutchinson, who added to it the authority of Revelation. The created agents he chose in his cosmogony were fire, light, and air. These, we see, have indeed a very considerable share in the operations of nature; but unless we explain the manner in which they operate, our knowledge is not at all increased, and we might as well have been contented with the Newtonian attraction and repulsion, or even the occult qualities of Aristotle. Attempts have indeed been made to solve the phenomena

6
Disagree-
ment a-
mong his
followers.

7
Mr Mit-
chel, Bos-
covich, and
Dr Priest-
ley's opi-
nions.
† See Cobe-
son, n° 8.

8
Mr Hut-
chinson's
system.

* See *Astro-*
nomy,
n° 252.

4
Newtonian
system su-
percedesthe
Aristote-
lian and
Cartesian.

† See *Cobe-*
son, n° 2.

5
Three laws
of nature
laid down
by Sir Isaac.

G g

phenomena

Earth. phenomena of nature, from the action of these three agents, both by Hutchinson himself and many of his followers.—These attempts, however, have always proved unsuccessful. Some phenomena indeed may be explained pretty plausibly from the known action of these three; but when we come to speak of what may be called the *nicer operations* of nature, such as the growth of plants and animals, we are utterly at a loss.

A deficiency of active principles in all the theories yet invented.

The manifest deficiency of active principles in all the theories of the earth that have yet been invented, hath occasioned a constant search after others which should be able, by their superior activity, to fill up the blank which necessarily remained in the system.—Pythagoras, Plato, and Aristotle, being unable to account for the formation of the earth from their four elements, called in the assistance of a *fifth*, which was never yet discovered. Epicurus, finding the motions attributed to his atoms by Democritus to be insufficient, had recourse to an imaginary, and on his own principles *impossible*, declination of the atoms. Des Cartes, finding the atoms themselves insufficient, asserted that they were not atoms, but might be broken into smaller parts, and thus constitute matter of various degrees of subtilty. The Newtonian philosophers have found Des Cartes's system insufficient; but being greatly distressed in their attempts to solve all the phenomena of nature by mere attraction and repulsion, have been obliged to call in the action of *mind* to their assistance. The Hutchinsonians were hardly put to it in accounting for every thing by the action of fire, light, and air, when luckily the discoveries in electricity came to their assistance. It must be owned, that this fluid does indeed come in like a kind of fifth element, which in many cases appears to be the animating principle of nature. For some time past, almost all the remarkable phenomena in nature have been explained by electricity, or the action of the electric fluid. But unless this action is explained, we are got no farther than we were before. To say that any thing is done by electricity, is not more intelligible than to say that it was done by attraction. If we explain an effect by a material cause, it ought to be done upon mechanical principles. We ought to be sensible how one part of matter acts upon another part in such a manner as to produce the effect we desire to explain. The electrical philosophers, however, have not yet been able to investigate the manner in which this subtle fluid operates; and hence the many discoveries in electricity have not contributed to throw that light on the theory of the earth, which perhaps they may do hereafter. With some philosophers, however, the electric fluid itself, and indeed all the powers of nature, were in danger of being superseded by a principle, lately very little known, called the *phlogiston*.—

Phil. Transf. Vol. 67.

Thus, Mr Henly tells us*, that Mr Clarke, an ingenious gentleman in Ireland, hath discovered all the different kinds of air produced from metals, &c. by Dr Priestley, to be only *phlogistic vapours* arising from these substances. Dr Priestley himself supposes, that the electric light is a modification of *phlogiston*; and consequently thinks it probable, that all light is a modification of the same. Fire or flame is thought to be a chemical combination of air with the phlogiston; and phlogiston is thought to give the elasticity to air, and every other elastic fluid, &c. Another party, seem-

ingly jealous of the powers of this new principle, have denied its existence altogether, and in its stead introduced another equally insufficient, called the *oxygenous principle*. Others have reduced all nature to the two principles called *principium forbile* and *principium proprium*. All these, however, are shown, in other parts of this work, to be mere inactive substances; the phlogiston, common charcoal; the oxygenous principle, water deprived of the quantity of phlogiston it usually contains; the principium forbile, the same; and the principium proprium, a name for the particular modification of the atoms, or what we please to call the invisible essence of matter which distinguishes one body from another, and which must be for ever unknown to all human creatures.—Be this as it will, the late discoveries in electricity have tended very much to change the form of the Newtonian philosophy, and to introduce that *materialism* into our theories of the natural phenomena which is by some people so much complained of.

From this general history of the different agents which philosophers have chosen to account for the original formation of the earth, and for its preservation in the present form, it appears, that scarce any advance in true knowledge hath yet been made. All the agents have been prodigiously defective; electricity itself, as far as yet known, not excepted. But before we enter into a particular consideration of those theories which seem most worthy of notice, it will be necessary to point out the principal difficulties which stand in the way of one who attempts to give a complete theory of the earth.

10 Little progress as yet made in true philosophy.

11 Difficulties which occur in forming a theory of the earth.

1. The earth, although pretty much of a spherical figure, is not completely so; but protuberates considerably about the equatorial parts, and is proportionably flattened at the poles, as is undeniably proved by the observations of modern mathematicians†. The question here is, Why the natural cause which gave the earth so much of a spherical figure, did not make it a complete and exact sphere?

† See Geography.

2. The terraqueous globe consists of a vast quantity of water as well as dry land. In many places, such as the Isthmus of Darien, a narrow neck of land is interposed betwixt two vast oceans. These beat upon it on either side with vast force; yet the Isthmus is never broke down nor diminished. The case is the same with the Isthmus of Suez which joins Asia and Africa, and with that which joins the Morea or ancient Peloponnesus to the continent. (The difficulty is, By what natural power or law are these narrow necks of land preserved amidst the waters which threaten them on both sides with destruction?)

3. The surface of the earth is by no means smooth and equal; but in some places raised into enormous ridges of mountains, and in others sunk down in such a manner as to form deep valleys. These mountains, though they have been exposed to all the injuries of the weather for many thousand years, exhibit no signs of decay. They still continue of the same size as before, though vast quantities of earth are frequently washed down from them by the rains, which, together with the force of gravity, tending to level and bring them on an equality with the plains on which they stand, we might reasonably think, ought by this time to have rendered them smaller than before. It must therefore

therefore

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therefore be inquired into, By what natural cause the mountains were originally formed, and how they come to preserve their size without any remarkable diminution?

4. The internal parts of the earth are still more wonderful than the external. The utmost industry of man, indeed, can penetrate but a little way into it. As far as we can reach, however, it is found to be composed of dissimilar strata lying one upon another, not commonly in a horizontal direction, but inclined to the horizon at different angles. These strata seem not to be disposed either according to the laws of gravity or according to their density, but as it were by chance. Besides, in the internal parts of the earth are vast chasms and vacuities. By what means were these strata originally deposited, the fissures and chasms made, &c.?

5. In many places of the earth, both on the surface and at great depths under it, vast quantities of marine productions, such as shells, &c. are to be met with. Sometimes these shells are found in the midst of solid rocks of marble and limestone. In the very heart of the hardest stones, also, small vegetable substances, as leaves, &c. are sometimes to be found. The question is, By what means were they brought thither?

These are some of the most striking difficulties which present themselves to one who undertakes to write a natural history or theory of the earth. The most remarkable attempts to produce a theory of this kind are the following.

¹²
Dr Burnet's
theory.

I. According to Dr Burnet, the earth was originally a fluid mass, or chaos, composed of various substances differing both in density and figure. Those which were most heavy, sunk to the centre, and formed there a hard solid body: those which were specifically lighter remained next above; and the waters, which were lightest of all, covered the earth all round. The air, and other ethereal fluids, which are still lighter than water, floated above it, and surrounded the globe also. Between the waters, however, and the circumambient air, was formed a coat of oily and unctuous matter lighter than water. The air at first was very impure, and must necessarily have carried up with it many of those earthy particles with which it was once blended: however, it soon began to purify itself, and deposit those particles upon the oily crust above mentioned; which, soon uniting together, the earth and oil became the crust of vegetable earth, with which the whole globe is now covered. His account of the destruction of the primeval world by the flood, by the falling down of the shell of earth into the waters of the abyss, is given under the article DELUGE. It only remains then to give his account of the manner in which he relieves the earth from this universal destruction; and this he does as follows. These great masses of earth, says he, falling into the abyss, drew down with them vast quantities also of air; and by dashing against each other, and breaking into small parts by the repeated violence of the shock, they at length left between them large cavities filled with nothing but air. These cavities naturally offered a bed to receive the influent waters; and in proportion as they filled, the face of the earth became once more visible. The higher parts of its broken surface, now become the tops of mountains, were the first that appeared; the plains soon after came forward; and at length the whole globe was

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delivered from the waters, except the places in the lowest situations; so that the ocean and seas are still a part of the ancient abyss, that have had no place to which they might return. Islands and rocks are fragments of the earth's former crust; continents are larger masses of its broken substance; and all the inequalities that are to be found on the surface of the present earth are effects of the confusion into which both earth and water were at that time thrown.

II. Dr Woodward begins with asserting, that all terrene substances are disposed in beds of various natures, lying horizontally one over the other, somewhat like the coats of an onion: that they are replete with shells, and other productions of the sea; these shells being found in the deepest cavities, and on the tops of the highest mountains. From these observations, which are warranted by experience, he proceeds to observe, that these shells and extraneous fossils are not productions of the earth, but are all actual remains of those animals which they are known to resemble; that all the strata or beds of the earth lie under each other in the order of their specific gravity, and that they are disposed as if they had been left there by subsiding waters. All this he very confidently affirms, tho' daily experience contradicts him in some of them; particularly, we often find layers of stone over the lightest soils, and the softest earth under the hardest bodies. However, having taken it for granted, that all the layers of the earth are found in the order of their specific gravity, the lightest at top, and the heaviest next the centre, he consequently asserts, that all the substances of which the earth is composed were originally in a state of dissolution. This dissolution he supposes to have taken place at the flood: but being aware of an objection, that the shells, &c. supposed to have been deposited at the flood are not dissolved, he exempts them from the solvent power of the waters, and endeavours to show that they have a stronger cohesion than minerals; and that, while even the hardest rocks are dissolved, bones and shells may remain entire.

¹³
Dr Woodward's.

III. Mr Whiston supposes the earth to have been originally a comet; and considers the Mosaic account of the creation as commencing at the time when the Creator placed this comet in a more regular manner, and made it a planet in the solar system. Before that time, he supposes it to have been a globe without beauty or proportion; a world in disorder, subject to all the vicissitudes which comets endure; which, according to the present system of philosophy, must be alternately exposed to the extremes of heat and cold. These alternations of heat and cold, continually melting and freezing the surface of the earth, he supposes to have produced, to a certain depth, a chaos resembling that described by the poets, surrounding the solid contents of the earth, which still continued unchanged in the midst; making a great burning globe of more than 2000 leagues in diameter. This surrounding chaos, however, was far from being solid: he resembles it to a dense, though fluid atmosphere, composed of substances mingled, agitated, and shocked against each other; and in this disorder he supposes the earth to have been just at the eve of the Mosaic creation. But upon its orbit being then changed, when it was more regularly wheeled round the sun, every thing took its proper place, every part of the surrounding fluid then

¹⁴
Mr Whiston's.

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fell into a certain situation according as it was light or heavy. The middle or central part, which always remained unchanged, still continued so; retaining a part of that heat which it received in its primeval approaches towards the sun; which heat he calculates may continue about 6000 years. Next to this fell the heavier parts of the chaotic atmosphere, which serve to sustain the lighter: but as in descending they could not entirely be separated from many watery parts, with which they were intimately mixed, they drew down these also along with them; and these could not mount again after the surface of the earth was consolidated: they therefore surrounded the heavy first-descending parts in the same manner as these surrounded the central globe. Thus the entire body of the earth is composed next the centre of a great burning globe: next this is placed an heavy terrene substance that encompasses it; round which is circumfused a body of water. Upon this body of water is placed the crust of earth on which we inhabit: so that, according to Mr Whiston, the globe is composed of a number of coats or shells, one within the other, all of different densities. The body of the earth being thus formed, the air, which is the lightest substance of all, surrounded its surface; and the beams of the sun darting through, produced the light, which, we are told by Moses, first obeyed the divine command.

The whole economy of the creation being thus adjusted, it only remained to account for the risings and depressions on the surface of the earth, with the other seeming irregularities of its present appearance. The hills and valleys are by him considered as formed by their pressing upon the internal fluid which sustains the external shell of earth, with greater or less weight: those parts of the earth which are heaviest sink the lowest into the subjacent fluid, and thus become valleys: those that are lightest rise higher upon the earth's surface, and are called *mountains*.

Such was the face of nature before the deluge: the earth was then more fertile and populous than it is at present; the life of men and animals was extended to ten times its present duration; and all these advantages arose from the superior heat of the central globe, which has ever since been cooling. As its heat was then in its full power, the genial principle was also much greater than at present; vegetation and animal increase were carried on with more vigour; and all nature seemed teeming with the seeds of life. But as these advantages were productive only of moral evil, it was found necessary to destroy all living creatures by a flood; and in what manner this punishment was accomplished, according to Mr Whiston, is particularly taken notice of under the article *DELUGE*.

15
Mr Buffon's theory

IV. M. Buffon's theory differs very widely from the foregoing. He begins with attempting to prove, that this world which we inhabit is no more than the ruins of a world. "The surface of this immense globe (says he) exhibits to our observation, heights, depths, plains, seas, marshes, rivers, caverns, gulfs, volcanoes; and on a cursory view, we can discover in the disposition of these objects neither order nor regularity. If we penetrate into the bowels of the earth, we find metals, minerals, stones, bitumens, sands, earths, waters, and matter of every kind, placed as it were by mere accident, and without any apparent design. Upon a

nearer and more attentive inspection, we discover funk mountains, caverns filled up, shattered rocks, whole countries swallowed up, new islands emerged from the ocean, heavy substances placed above light ones, hard bodies inclosed within soft bodies: in a word, we find matter in every form, dry and humid, warm and cold, solid and brittle, blended in a chaos of confusion, which can be compared to nothing but a heap of rubbish, or the ruins of a world."

When taking a particular survey of the external surface of the globe, he begins with the ocean, and the motion communicated to it by the influence of the sun and moon which produces the tides.—"In examining the bottom of the sea (says he), we perceive it to be equally irregular as the surface of the dry land. We discover hills and valleys, plains and hollows, rocks and earths of every kind; we discover likewise, that islands are nothing but the summits of vast mountains, whose foundations are buried in the ocean. We find other mountains whose tops are nearly on a level with the surface of the water; and rapid currents which run contrary to the general movement. These currents sometimes run in the same direction; at other times their motion is retrograde; but they never exceed their natural limits, which seem to be as immutable as those which bound the efforts of land-rivers. On one hand we meet with tempestuous regions, where the winds blow with irresistible fury; where the heavens and the ocean, equally convulsed, are mixed and confounded in the general shock; violent intestine motions, tumultuous swellings, water-spouts, and strange agitations produced by volcanoes, whose mouths, tho' many fathoms below the surface, vomit forth torrents of fire; and push, even to the clouds, a thick vapour, composed of water, sulphur, and bitumen; and dreadful gulphs or whirlpools, which seem to attract vessels for no other purpose than to swallow them up. On the other hand we discover vast regions of an opposite nature, always smooth and calm, but equally dangerous to the mariner. To conclude, directing our eyes toward the southern or northern extremities of the globe, we discover huge masses of ice, which, detaching themselves from the polar regions, advance, like floating mountains, to the temperate climates, where they dissolve and vanish from our view. The bottom of the ocean and the shelving sides of rocks produce plentiful crops of plants of many different species: its soil is composed of sand, gravel, rocks, and shells; in some places it is a fine clay, in others a compact earth: and in general, the bottom of the sea has an exact resemblance to the dry land which we inhabit.

"Let us next take a view of the dry land. Upon an attentive observation of this, we will find, that the great chains of mountains lie nearer the equator than the poles; that in the old continent their direction is more from east to west than from south to north; and that, on the contrary, in the new continent they extend more from north to south than from east to west. But what is still more remarkable, the figure and direction of these mountains, which have a most irregular appearance, correspond so wonderfully, that the prominent angles of one mountain are constantly opposite to the concave angles of the neighbouring mountain, and of equal dimensions, whether they be separated by an extensive plain or a small valley. I have further

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Earth. further remarked, that opposite hills are always nearly of the same height; and that mountains generally occupy the middle of continents, islands, and promontories, dividing them by their greatest lengths. I have likewise traced the courses of the principal rivers, and find that their direction is nearly perpendicular to the sea-coasts into which they empty themselves; and that during the greatest part of their courses they follow the direction of the mountains from which they derive their origin. The sea-coasts are generally bordered with rocks of marble and other hard stones; or rather with earth and sand accumulated by the waters of the sea, or brought down and deposited by rivers. In opposite coasts, separated only by small arms of the sea, the different strata or beds of earth are of the same materials. I find that volcanoes never exist but in very high mountains; that a great number of them are entirely extinguished; that some are connected to others by subterranean passages, and their eruptions not unfrequently happen at the same time. There are similar communications between certain lakes and seas. Some rivers suddenly disappear, and seem to precipitate themselves into the bowels of the earth. We likewise find certain mediterranean or inland seas, that constantly receive from many and great rivers prodigious quantities of water, without any augmentation of their bounds; probably discharging by subterraneous passages all those extraneous supplies. It is likewise easy to distinguish lands which have been long inhabited, from those new countries where the earth appears in a rude state, where the rivers are full of cataracts, where the land is nearly overflowed with water or burnt up with drought, and where every place capable of producing trees is totally covered with wood.

"Proceeding in our examination, we discover that the upper stratum of the earth is universally the same substance: that this substance, from which all animals and vegetables derive their growth and nourishment, is nothing but a composition of the decayed parts of animal and vegetable bodies, reduced into such small particles that their former organic state is not distinguishable. Penetrating a little deeper, we find the real earth, beds of sand, limestone, clay, shells, marble, gravel, chalk, &c. These beds are always parallel to each other, and of the same thickness throughout their whole extent. In neighbouring hills, beds or strata of the same materials are uniformly found at the same levels, though the hills be separated by large and deep valleys. Strata of every kind, even of the most solid rocks, are uniformly divided by perpendicular fissures. Shells, skeletons of fishes, marine plants, &c. are often found in the bowels of the earth, and on the tops of mountains, even at the greatest distances from the sea. These shells, fishes, and plants, are exactly similar to those which exist in the ocean. Petrified shells are to be met with almost every where in prodigious quantities: they are not only inclosed in rocks of marble and limestone, as well as in earths and clays, but are actually incorporated and filled with the very substances in which they are inclosed. In fine, I am convinced, from repeated observation, that marbles, limestones, chalks, marles, clays, sand, and almost all terrestrial substances, wherever situated, are full of shells and other spoils of the ocean."

From these positions, which he lays down as facts, Mr Buffon draws the following conclusions:

1. The changes which the earth has undergone within these last 2000 or 3000 years must be inconsiderable, when compared with the great revolutions that took place in those ages immediately succeeding the creation. The reason he gives for this assertion is, that terrestrial substances could not acquire solidity but by the continued action of gravity: hence the earth must have been originally much softer than it is now, and therefore more apt to be changed by causes which cannot now affect it.

2. It seems an incontrovertible fact, that the dry land which we now inhabit, and even the summits of the highest mountains, were formerly covered with the waters of the sea; for shells and other marine bodies are still found upon the very tops of mountains.

3. The waters of the sea have remained for a long track of time upon the surface; because in many places, such immense banks of shells have been discovered, that it is impossible so great a multitude of animals could exist at the same time.

4. From this circumstance it likewise appears, that although the materials on the surface of the earth were then soft, easily disunited, moved, and transported by the waters, yet these transportations could not be suddenly effected: they must have been gradual and successive, as sea-bodies are sometimes found more than 1000 feet below the surface; and such a thickness of earth or stone could not be accumulated in a short time.

5. It is impossible these effects could be owing to the universal deluge. For though we should suppose, that all the shells in the bottom of the ocean should be deposited upon the dry land; yet, besides the difficulty of establishing this supposition, it is plain, that as shells are found incorporated in marble, and in the rocks of the highest mountains, we must suppose these rocks and marbles to have been formed all at the very instant when the deluge took place; and that before this grand revolution, there were neither mountains, nor marbles, nor rocks, nor clays, nor matter of any kind similar to what we are now acquainted with; as they all, with few exceptions, contain shells and other productions of the ocean. Besides, at the time of the universal deluge, the earth must have acquired a considerable degree of solidity, by the action of gravity for more than 16 centuries. During the short time the deluge lasted, therefore, it is impossible that the waters should have overturned and dissolved the whole surface of the earth to the greatest depths.

6. It is certain (for what reason he does not mention), that the waters of the sea have, at some period or other, remained for a succession of ages upon what we now know to be dry land; and consequently that the vast continents of Asia, Europe, Africa, and America, were then the bottom of an immense ocean, replete with every thing which the present ocean produces.

7. It is likewise certain, that the different strata of the earth are horizontal and parallel to each other. This parallel situation must therefore be owing to the operation of the waters, which have gradually accumulated the different materials, and given them the same position which the water itself invariably assumes.

8. It is certain that these strata must have been gradually

Earth. dually formed, and are not the effect of any sudden revolution; because nothing is more frequent than strata composed of heavy materials placed above light ones; which never could have happened if, according to some authors, the whole had been blended and dissolved by the deluge, and afterwards precipitated.

9. No other cause than the motion and sediments of water could possibly produce the regular position of the various strata of which the superficial part of this earth consists. The highest mountains are composed of parallel strata, as well as the lowest valleys. Of course, the formation of mountains cannot be attributed to the shock of earthquakes, or to the eruptions of volcanoes. Such small eminences as have been raised by volcanoes or convulsions of the earth, instead of being composed of parallel strata, are mere masses of weighty materials, blended together in the utmost confusion.

Having now, as he thinks, *proved*, that the dry and habitable part of the earth has remained for a long time under the waters of the sea, and consequently must have undergone the same changes that now take place at the bottom of the sea, he proceeds to inquire what these changes are.

10. The ocean, since the creation of the world, has been constantly agitated by the tides, occasioned by the action of the sun and moon; and this agitation is greater in the equatorial than in the other parts of the globe, because the action of the sun and moon is there strongest.

11. The earth performs a rapid motion on its axis; and consequently its parts have a centrifugal force, which is also greatest at the equator.

12. From the combined action of the two last mentioned causes, the tides and the motion of the earth, it may be fairly concluded, that although this globe had been originally a perfect sphere, its diurnal motion, and the ebbing and flowing of the tides, must necessarily, in a succession of time, have elevated the equatorial parts, by gradually carrying mud, earth, sand, shells, &c. from other climates, and depositing them at the equator.

13. On this supposition, the greatest inequalities on the surface of the earth ought to be found, and in fact are found, in the neighbourhood of the equator.

14. As the alternate motion of the tides has been constant and regular since the existence of the world, it is natural to think, that, at each tide, the water carries from one place to another a small quantity of matter, which falls to the bottom as a sediment, and forms those horizontal and parallel strata that every where appear. Here it may indeed be objected, that as the flux is equal to, and regularly succeeded by, the reflux, the two contrary motions will balance each other; and whatever is brought in by the flux will be carried back by the reflux. The motion of the ocean, therefore, could never be the cause of the formation even of parallel strata; much less of mountains, and all the inequalities to be observed in this globe. To this Mr Buffon replies, that the alternate motion of the waters is by no means equal; for the sea has a continual motion from east to west: the agitations occasioned by the winds likewise produce great inequalities in the tides. It must also be acknowledged, that, by every motion of the sea, particles of earth and other matter must be carried from one place and

deposited in another; and that these collections of matter must assume the form of parallel and horizontal strata. Lastly, this objection is obviated by a well known fact. On all coasts where the ebbing and flowing of the sea is discernible, numberless materials are brought in by the flux, which are not carried back by the reflux. The sea gradually increases on some places and recedes from others; narrowing its limits by depositing earth, sand, shells, &c. which naturally take a horizontal position. These materials when accumulated, and elevated to a certain degree, gradually shut out the water, and remain for ever in the form of dry land.

15. The possibility of a mountain's being formed at the bottom of the sea by the motion and sediments of the water, will appear from the following considerations. On a coast which the sea washes with violence during the flow of tide, some part of the earth must be carried off at every stroke of the waves. Even where the sea is bounded by a rock, it is a known fact, that the rock itself is greatly wasted by the water; and consequently that small particles are carried off by the retreat of every wave. Those particles of earth or stone are necessarily transported to some distance. Whenever the agitation of the water ceases, the particles are precipitated in the form of a sediment, and lay the foundation of a first stratum, which is either horizontal or inclined, according to the situation of the surface on which they fall. This stratum is soon succeeded by another, produced by the same cause; and thus a considerable quantity of matter will be amassed, and deposited in parallel beds. In process of time this gradually accumulating mass will become a mountain in the bottom of the sea, exactly resembling, both in external and internal structure, those mountains which we see on the dry land. If there happened to be shells in that part of the bottom of the sea where we have supposed the sediments to be deposited, they will be covered, filled, and incorporated with the deposited matter, and form a part of the general mass. These shells will be lodged in different parts of the mountain, corresponding to the times in which they were deposited: those which lay at the bottom before the first stratum was formed, will occupy the lowest station; the others will be found in places more elevated.

16. It has been imagined that the agitation of the sea produced by the winds and tides is only superficial, and does not affect the bottom, especially where it lies very deep. But it ought to be remembered, that whatever be the depth, the whole mass is put in motion by the tides at the same time; and that, in a fluid globe, this motion would be communicated even to the centre. The attractive power, which occasions the flux and reflux, is penetrating. It acts equally upon every particle of the mass; so that the quantity of its force at different depths may be determined by calculation. We cannot therefore hesitate in pronouncing, that the tides, the winds, and all other causes of motion in the sea, must produce heights and inequalities in its bottom; and that these heights must uniformly be composed of regular strata either horizontal or inclined. The heights thus produced will gradually augment; like the waves which formed them, they will mutually respect each other; and if the extent of the

Earth. base be great, in a course of years they will form a vast chain of mountains.

17. Whenever eminences are formed, they interrupt the uniform motion of the waters, and produce currents. Between two neighbouring heights in the bottom of the ocean there must be a current which will follow their common direction, and, like a river, cut a channel, the angles of which will be alternately opposite through the whole extent of its course. These heights must continually increase: for, during the flow, the water will deposit its ordinary sediment upon their ridges; and the waters which are impelled by the current will force along, from great distances, quantities of matter, which will subside between the hills, and, at the same time, scoop out a valley with corresponding angles at their foundation. Now, by means of these different motions and sediments, the bottom of the ocean, though formerly smooth, must soon be furrowed and interspersed with hills and chains of mountains, as we actually find it at present. The soft materials of which the eminences were originally composed, would gradually harden by their own gravity. Such of them as consisted of sandy and crystalline particles would produce those enormous masses of rock and flint, in which we find crystals and other precious stones. Others, composed of stony particles mixed with shells, give rise to those beds of limestone and marble in which vast quantities of sea-shells are still found incorporated.

18. These causes, as before observed, act with greater force under the equator than in other climates; for there the tides are higher, and the winds more uniform. The mountains of Africa and Peru are the highest in the world; often extending through whole continents, and stretching to great distances under the waters of the ocean. The mountains of Europe and Asia, which extend from Spain to China, are not so high as those of Africa and South America. According to the relations of voyagers, the mountains of the north are but small hills, when compared with the mountains of the equatorial regions. Those prodigious chains of mountains which run from east to west in the old continent, and from north to south in the new, must have been formed by the general motion of the tides. But the origin of the less considerable hills must be ascribed to particular motions occasioned by winds, currents, and other irregular agitations of the sea.

16
How the
earth was
deserted by
the ocean,
and left
dry.

Having thus discussed some very important points respecting the theory of the earth, our author now proceeds to answer other questions which seem still more difficult of solution.

19. But how has it happened that this earth, which we and our ancestors have inhabited for ages, which, from time immemorial, has been an immense continent, dry, compact, and removed from the reach of water, should, if formerly the bottom of an ocean, be now exalted to such a height above the waters, and so completely separated from them? Since the waters remained so long upon the earth, why have they now deserted it? What accident, what cause, could introduce a change so great? A little reflection, says he, will furnish us with at least plausible solutions to these seemingly so difficult questions. We daily observe the sea gaining ground on certain coasts, and losing it on o-

thers. We know that the ocean has a general and uniform motion from east to west: that it makes violent efforts against the rocks and low grounds which encircle it; that there are whole provinces which human industry can hardly defend against the fury of the waves; and that there are instances of islands which have but lately emerged from the waters, and of regular inundations. History informs us of inundations and deluges of a more extensive nature. Ought not all this to convince us, that the surface of the earth has experienced very great revolutions, and that the sea may have actually given up possession of the greatest part of the ground which it formerly occupied? For example, let us suppose, that the old and new worlds were formerly but one continent; and that, by a violent earthquake, the ancient Atlantis of Plato was sunk. The consequence of this mighty revolution must necessarily be, that the sea would rush in from all quarters, and form what is now called the *Atlantic Ocean*; and vast continents, perhaps those we now inhabit, would of course be left dry. This great revolution might be effected by the sudden failure of some immense cavern in the interior parts of the globe, and an universal deluge would infallibly succeed.

20. But, however conjectures of this kind may stand, it is certain that such a revolution hath happened: and we may even believe that it hath happened naturally; for if a judgment of the future is to be formed from the past, we have only to attend carefully to what passes before our eyes. It is a fact established by the repeated observation of voyagers, that the ocean has a constant motion from east to west. This motion, like the trade-winds, is not only perceived between the tropics, but through the whole temperate climates, and as near the poles as navigators have approached. As a necessary consequence of this motion, the Pacific Ocean must make continual efforts against the coasts of Tartary, China, and India; the Indian Ocean must act against the east coast of Africa; and the Atlantic must in a similar manner act against all the eastern coasts of America. Hence the sea must have gained, and will always continue to gain, on the east, and to lose on the west. This of itself would be sufficient to prove the possibility of the change of the sea into land, and land into sea. If such is the natural effect of the sea's motion from east to west, may it not reasonably be supposed, that Asia, and all the eastern continent, is the most ancient country in the world? and that Europe, and part of Africa, especially the west parts of these continents, as Britain, France, Spain, &c. are countries of a more recent date?

21. The cause of the perpendicular fissures with which the earth abounds, is easily investigated. As various materials constituting the different strata were transported by the waters, and deposited in the form of sediments, they would at first be in a very diluted state, and would gradually harden and part with the superfluous quantity of moisture they contained. In process of time, drying, they would naturally contract and split at irregular distances. These fissures necessarily assumed a perpendicular direction: because in this direction the action of gravity of one particle upon another is equal to nothing: but it acts directly opposite to this description, in a horizontal situation: the di-

Earth.

Earth. minution in bulk could have no sensible effect but in a vertical line. The contraction of the parts in drying, therefore, and not the contained water forcing an issue, as has been alleged by some, is the cause of perpendicular fissures; for it may be often remarked, that the sides of those fissures, through their whole extent, correspond as exactly as the two sides of a split piece of wood.

22. Perpendicular fissures vary greatly as to the extent of their openings. Some are about half an inch or an inch; others a foot or two feet; some extend several fathoms, and give rise to those vast precipices which so frequently occur between opposite parts of the same rocks, in the Alps and other high mountains. It is plain, that the fissures, the openings of which are small, have been occasioned solely by drying. But those which extend several feet are partly owing to another cause; namely, the sinking of the foundation upon one side, while that of the other remains firm. If the base sinks but a line or two, when the height is considerable, an opening of several feet, or even fathoms, will be the consequence. When rocks are founded on clay or sand, they sometimes slip a little to one side; and the fissures are of course augmented by this motion.

23. The large openings, however, and prodigious cuts, which are to be met with in rocks and mountains, are to be ascribed to another cause. They could be produced no other way than by the sinking of immense subterraneous caverns, that were unable any longer to sustain their incumbent load. But these cuts or intervals in mountains are not of the same nature with the perpendicular fissures: they appear to have been ports opened by the hand of nature for the communication of nations. This seems to be the intention of all large openings in chains of mountains, and of those straits by which different parts of the ocean are connected; as the straits of Thermopylae, of Gibraltar, &c. the gaps or ports in mount Caucasus, the Cordeleras, &c.

24. But the greatest changes upon the surface of the earth are occasioned by rains, rivers, and torrents from the mountains. These derive their origin from vapours raised by the sun from the surface of the ocean, and which are transported by the winds through every climate. The progress of these vapours, which are supported by the air, and transported at the pleasure of the winds, is interrupted by the tops of the mountains, where they accumulate into clouds, and fall down in the form of rain, dew, or snow. At first, these waters descended into the plains without any fixed course; but they gradually hollowed out proper channels for themselves. By the power of gravity they ran to the bottom of the mountains; and penetrating or dissolving the lower grounds, they carried along with them sand and gravel, cut deep furrows in the plains, and thus opened passages to the sea, which always receives as much water by rivers as it loses by evaporation. The windings in the channels of rivers have uniformly corresponding angles on their opposite banks; and as mountains and hills, which may be regarded as the banks of the valleys by which they are separated, have likewise sinuosities with corresponding angles, this circumstance seems to demonstrate, that the valleys have been gradually formed by currents of the ocean, in the same manner as the channels of ri-

vers have been produced. Rivers produce considerable changes on the surface of the earth; they carry off the soil, wear away the most solid rocks, and remove every thing that opposes their passage. The waters of the clouds also, which descend upon the mountains, by continually washing away some part of the earth, tend to level them with the plains; and would undoubtedly do so, if time enough were allowed for that purpose.

25. From what has been advanced, we may conclude, that the flux and reflux of the ocean have produced all the mountains, valleys, and other inequalities on the surface of the earth: that currents of the sea have scooped out the valleys, elevated the hills, and bestowed on them the corresponding directions: that the same waters of the ocean, by transporting and depositing earth, &c. have given rise to the parallel strata: that the waters from the heavens gradually destroy the effects of the sea, by continually diminishing the height of the mountain, filling up the valleys, and choaking up the mouths of rivers; and by reducing every thing to its proper level, they will in time restore the earth to the sea, which by its natural operations will again create new continents interspersed with mountains and valleys, and every way similar to those which we now inhabit.

Thus far our author preserves some degree of plausibility in his reasoning; but in his account of the original formation of the earth, he certainly goes to the utmost verge of *probability*, or rather of *possibility*, in his suppositions. According to him, all the planets in our system were originally parts of the sun himself. They were detached from his body all at once by a mighty stroke of a comet. The possibility of driving off such a quantity of matter from the sun by a single stroke, he labours hard to prove; but this is far from being the greatest difficulty in his system.—“To this theory (says he) it may be objected, that if the planets had been driven off from the sun by a comet, in place of describing circles round him, they must, according to the law of projectiles, have returned to the same place from whence they had been forced; and, therefore, that the projectile force of the planets cannot be attributed to the impulse of a comet.”

“I reply, that the planets issued not from the sun in the form of globes, but in the form of torrents; the motion of whose anterior particles behaved to be accelerated by those behind, and the attraction of the anterior particles would also accelerate the motion of the posterior; and that this acceleration, produced by one or both of these causes, might be such as would necessarily change the original motion arising from the impulse of the comet; and that, from the cause, might result a motion similar to what takes place in the planets; especially when it is considered, that the shock of the comets removes the sun out of its former station. This reasoning may be illustrated by an example. Suppose a musket-ball discharged from the top of a mountain, and that the force of the powder was sufficient to send it beyond a semidiameter of the earth: it is certain that this ball would revolve round the earth, and return at every revolution to the place from whence it had been discharged. But, instead of a musket-ball, if a rocket were employed, the continued action of the fire would greatly accelerate the original

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Buffon's account of the formation of the planets.

Earth.

original impulsive motion. This rocket would by no means return to the same point like the ball; but, *cæteris paribus*, would describe an orbit, the perigee of which would be more or less distant from the earth in proportion to the greatness of the change produced in its direction by the accelerating force of the fire. In the same manner, if the original projectile force impressed by the comet on the torrent of solar matter was accelerated, it is probable that the planets formed by this torrent acquired their circular or elliptical movements around the sun."

In like manner he accounts for the formation and circulation of the secondary planets. The revolutions of the primaries on their axes, he accounts for from the obliquity of the original stroke impressed by the comet. The oblate spheroidal figure of the earth is easily deduced from its diurnal motion, and the fluidity of the whole at its first formation. The flattening at the poles he estimates at about one 230th part of the whole. As this computation differs considerably from the account given by the mathematicians who were sent to different parts of the world on purpose to determine the figure of the earth, and who made the flatness at the poles equal to one 175th part of the whole, he supposes this difference to have arisen from changes that have since taken place on the surface of the earth, occasioned by the causes already mentioned. He then proceeds to account for the formation of all things, in the following manner.—"It is therefore evident, that the earth assumed its figure when in a melted state; and, to pursue our theory, it is natural to think, that the earth, when it issued from the sun, had no other form but that of a torrent of melted and inflamed matter: that this torrent, by the mutual attraction of its parts, took on a globular figure, which its diurnal motion changed into a spheroid: that when the earth cooled, the vapours, which were expanded like the tail of a comet, gradually condensed, and fell down in the form of water upon the surface, depositing at the same time a slimy substance mixed with sulphur and salts; part of which was carried by the motion of the waters into the perpendicular fissures of the strata, and produced metals; and the rest remained on the surface, and gave rise to the vegetable mould which abounds in different places, with more or less of animal or vegetable particles, the organization of which is not obvious to the senses.

"Thus the interior parts of the globe were originally composed of vitrified matter; and, I believe, they are so at present. Above this vitrified matter were placed those bodies which the fire had reduced to the smallest particles, as sands, which are only portions of glass; and above these pumice-stones and the scorixæ of melted matter, which produced the different clays. The whole was covered with water to the depth of 500 or 600 feet, which originated from the condensation of the vapours when the earth began to cool. This water deposited a stratum of mud, mixed with all those matters which are capable of being sublimed or exhaled by fire; and the air was formed of the most subtle vapours, which, from their levity, rose above the water.

"Such was the condition of the earth when the tides, the winds, and the heat of the sun, began to introduce changes on its surface. The diurnal motion

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of the earth, and that of the tides, elevated the waters in the equatorial regions, and necessarily transported thither great quantities of slime, clay, and sand; and by thus elevating those parts of the earth, they perhaps sunk those under the poles about two leagues, or a 230th part of the whole, as was formerly remarked: for the waters would easily reduce into powder pumice-stones, and other spongy parts of the vitrified matter upon the surface; and by this means excavate some places and elevate others, which, in time, would produce islands and continents, and all those inequalities on the surface, which are more considerable towards the equator than towards the poles. The highest mountains lie between the tropics and the middle of the temperate zones, and the lowest from the polar circles towards the poles. Indeed, both the land and sea have most inequalities between the tropics, as is evident from the incredible number of islands peculiar to those regions."

V. In the first volume of the Edinburgh Philosophical Transactions a new theory of the earth has been laid down at considerable length by Dr Hutton; of which the following is an abstract.

The general view of the terrestrial system conveys to our minds an idea of a "fabric, erected in wisdom, to obtain a purpose worthy of the power that is apparent in the production of it."

The end for which it was formed, as far as we can comprehend our author's meaning, is, that it might be an habitation for living creatures; and we are enabled to understand the constitution of this earth as a thing formed by design, "not only by seeing those general operations which depend on its construction as a machine, but also by perceiving how far the particulars in the construction of that machine depend on the operations of the globe."

In taking a comprehensive view of the mechanism of the globe, we observe three principal parts of which it is composed; and which, by being properly adapted to one another, form it into an habitable world. These are the solid body of the earth, the waters of the ocean, and the atmosphere surrounding the whole. On these our author observes,

1. The parts of the terrestrial globe more immediately exposed to our view are supported by a central body commonly supposed, but without any good reason, to be solid and inert.

2. The aqueous part, reduced to a spherical form by gravitation, has become oblate by the earth's centrifugal force. Its use is to receive the rivers, be a fountain of vapours, and to afford life to innumerable animals, as well as to be the source of growth and circulation to the organized bodies on earth.

3. The irregular body of land, raised above the level of the sea (though the smallest of these large divisions), is by far the most interesting, as immediately necessary to the support of animal life.

4. The atmosphere surrounding the whole is evidently necessary for innumerable purposes of life and vegetation, neither of which could subsist a moment without it.

Having thus considered the mechanism of the globe, Dr Hutton proceeds to investigate the powers by which it is upheld.—These are the gravitating and projectile forces by which the planets are guided, the

H h

influence

Earth.

Earth. influence of light and heat, cold and condensation; to which may be added electricity and magnetism.

22
Why the land must necessarily decay, and at last be destroyed.

In the further pursuit of our general or preparatory ideas, the Doctor observes, that "a solid body of land could not have answered the purpose of a habitable world, for a soil is necessary for the growth of plants; but a soil is only the materials collected from the destruction of the solid land. Therefore the surface of this land, inhabited by man, is made by nature to decay, in dissolving from the hard and compact state in which it is found below the soil; and this soil is necessarily washed away by the continual circulation of the water running from the summits of the mountains." Thus he supposes that the land must at last be entirely destroyed; a misfortune unavoidable from the very constitution of the globe as an habitable world. It remains, therefore, to be considered, whether there be, "in the constitution of this world, a reproductive operation by which a ruined constitution may be again repaired, and a duration and stability procured to the machine considered as capable of sustaining plants and animals?" The solution of this question, he says, is perhaps within the reach of human sagacity, and, as he justly observes, might add some lustre to science and the human intellect.

23
Marine animals of much higher antiquity than the human race.

With regard to the beginning of the world, though our author does not pretend to lay aside the Mosaic accounts concerning the origin of man, yet, says he, "though there has not been found in natural history any document by which a high antiquity might be attributed to the human race, this is not the case with regard to the inferior animals, particularly those which inhabit the ocean and its shores. We find in natural history monuments which prove that these animals had long existed; and we thus procure a measure for the computation of a period of time extremely remote, though far from being exactly ascertained.— Thus, in finding the relics of sea animals of every kind in the solid body of the earth, a natural history of those animals is formed, which includes a certain portion of time; and for the ascertaining this portion of time, we must again have recourse to the operations of this world.

From a view of the present construction and operations of nature, therefore, our author supposes, that we may understand what has formerly passed in the original formation of the globe; and then proceeds to reason in the following manner:

24
General

view of the solid parts of the globe.

The solid parts of the globe are, in general, composed of sand, gravel, argillaceous and calcareous strata, or of these mixed with some other substances. Sand is separated and fixed by streams and currents; gravel is formed by the mutual attrition of stones agitated in water; and marly or argillaceous strata have been collected by subsiding in water in which those earthy substances had floated. Thus, so far as the earth is formed of these materials, it would appear to have been the production of water, winds, and tides.

25

Earth in a great measure composed of the exuviae of marine animals.

The next inquiry of our author is into the origin of our land, which he seems willing to derive entirely from the exuviae of marine animals. The only argument he makes use of for determining this most important point is drawn from the quantity of them to be met with in the different parts of it. "We find (says he) the marks of marine animals in the most solid parts

of the earth; consequently those solid parts have been formed after the ocean was inhabited by those animals which are proper to that fluid medium."

26

Marble and limestone totally to be derived from these.

That all the masses of marble or limestone are composed of the calcareous matter of marine bodies, he concludes, 1. From there being few in which some of those objects may not be found which indicate the marine origin of the mass; and a single cockle-shell or piece of coral found in a marble or limestone quarry, will certainly prove it to have been originally at the bottom of the sea as much as if it had been all composed of such bodies. 2. In the calcareous strata, which are evidently of marine origin, there are many parts of a sparry structure; which shows that in these places the original texture of those beds has been dissolved and a new structure assumed. This change is produced by crystallization, in consequence of a previous state of fluidity; which has so disposed the concreting parts, as to allow them to assume a regular shape and structure proper to that substance. 3. There are, in all the regions of the earth, huge masses of calcareous matter in that crystalline or sparry state, in which perhaps no vestige can be found of any organized body, nor any indication that such calcareous matter had belonged to animals; but as, in other masses, this sparry or crystalline state is evidently assumed by the calcareous matter of the marine productions, we have no reason to derive these from any other source: and hence, says our author, we are led to conclude, that all the strata of the earth, not only those consisting of such calcareous masses, but others superincumbent upon these, have had their origin at the bottom of the sea, by the collection of sand and gravel, of shells, of coralline and crustaceous bodies, and of earths and clays variously mixed, or separated and accumulated.

"The general amount of our reasoning (says he) is this; that nine-tenths perhaps, or 99 hundredths, of this earth, so far as we see, have been formed by natural operations of the globe, in collecting loose materials and depositing them at the bottom of the sea, consolidating those collections in various degrees, and either elevating those consolidated masses above the level on which they were formed, or lowering the level of that sea."

27

Almost the whole body of earth formed at the bottom of the sea.

With regard to the raising of the land, thus formed at the bottom of the sea, to some height above its surface, our author differs from Buffon, and contends, that "no motion of the sea occasioned by the earth revolving in this solar system could bring about that end; for let us suppose the axis of the earth to be changed from the present poles and placed in the equinoctial line, the consequence of this might indeed be the formation of a continent of land about each new pole, from whence the sea would run towards the new equator; but all the rest of the globe would remain an ocean. Some new points might be discovered, and others which appeared before above the surface of the sea would be sunk by the rising of the water; but, on the whole, land could only be gained substantially at the poles. Nor could the continents, even supposing they had been originally produced in this manner, have continued stationary for many thousand years, and presented to us, every where below their surface, masses of consolidated marble and other mineral substances, in a state as different as possible from what they were originally. Besides an operation, therefore, by which the

28

Could not be raised from thence by any motion of the water.

Earth. the earth at the bottom of the sea should be converted into an elevated land, or placed high above the level of the ocean, there is required a consolidating power, by which the loose materials that had subsided from water should be formed into masses of the most perfect solidity, having neither water nor vacuity betwixt their constituent parts, nor in the pores of these constituent parts themselves.

²⁹ Consolidating power of the strata to be discovered by an inspection of the materials themselves. This consolidating power, he is of opinion, must lie out of the reach of common observation, because the consolidated masses on the surface of the earth are now in a state of decay; and therefore we must look into these masses themselves, in order to discover the cause by which they assumed their present form.

In entering upon the investigation of this consolidating power, our author observes, that there are only two ways in which the requisite changes can happen, viz. simple congelation from a fluid state, or a continual accretion of solid particles. Fire and water, therefore, may be considered as the general agents in this operation; and we are to consider whether they have acted in the way of aqueous solution and crystallization, or in that of fusion. If the former of these ways is supposed to be that in which the strata in general have been consolidated, we may look for a considerable degree of uniformity in its effects. "The action of water (he says) upon all different substances is what we are well acquainted with; and there is no reason to conclude any thing mysterious in its operation, unless we suppose an immense compressing power to have some effect in altering it. Compression, however (he says), only alters the relation of evaporation to heat, or changes the degree of heat which water can contain. We are therefore to look for no occult quality in water acting at the bottom of the sea more than on the surface of the earth. Time, indeed, may do a great deal where the course of the operation is slow; but where it is contrary to the nature of the things to produce the change in question, it is plain that no length of time can have any effect."

³¹ Difficulties attending this supposition. Again, if the masses have been consolidated by crystallization, the bodies must first have been dissolved in water as a menstruum; and therefore another power is to be sought for by which the water might again be extricated from those endless labyrinths in which the solid matter of the strata is deposited, without leaving a fluid particle in its composition. There is likewise another difficulty in finding a source from whence the vast quantity of matter deposited in these strata should be derived. Besides, the water contained in the cavities and interstices of these bodies composing strata must be in a stagnating state; and consequently it can only act on the surface of those cavities which are to be filled up. "But with what are they to be filled? Not with water; they are full of this already: Not with the substance of those bodies which contain the water; this would be only to make one cavity in order to fill up another. If, therefore, the cavities of the strata are to be filled with solid matter by means of water, there must be made to pass through these porous masses water impregnated with some other substances in a dissolved state, and the aqueous menstruum must be separated from the dissolved substance, and to deposit the same in cavities through which the solution moves." This supposition is, however, according to

our author, inadmissible; for, in the case of materials accumulated in the bottom of the ocean, there is no proper means for separating the dissolved matter from the water included in these enormous masses; nor are there any means by which a circulation in those masses may be formed.

In the further prosecution of his subject, our author informs us, that "if water had been the menstruum by which the consolidating matter was introduced into the cavities of the strata, masses of those bodies that are soluble in water could only be found consolidated; and these only in such a state as the simple separation of the dissolving water might produce. But this is far from being the case. We have strata consolidated by calcareous spar; a thing perfectly distinguishable from the stalaetical concretion of the calcareous earth in consequence of aqueous solution. We have strata made solid by the formation of fluor; a substance, so far as we know, not soluble in water. We have strata consolidated with sulphureous and bituminous substances, which do not correspond to the solution in water. We have strata consolidated with siliceous matter in a state totally different from that in which it is deposited by water: we have them also consolidated by almost all the various metallic substances, with their almost endless mixtures and sulphureous compositions; that is to say, we find perhaps every different substance introduced into the interstices of strata which had been formed by subsidence at the bottom of the sea."

For these reasons, our author thinks it more probable that the strata have been consolidated by heat and fusion; and this hypothesis, he imagines, will solve every difficulty. And as the question is of the greatest importance to natural history, he proposes to investigate it at great length; at the same time that the subject is generalized as much as possible.

He considers, that among the various strata which compose the earth, we find some strata formed of siliceous and some of sulphureous materials; and with one or other, or both of these substances, the strata are so intimately mixed, that what has changed the siliceous or sulphureous materials from a fluid to a solid state, must likewise have materially affected the strata which contain them. The former he looks upon to be absolutely insoluble in water; and there are many other bodies whose solubility is so small, that it could not be discovered but by means of the siliceous matter. Of this an instance is adduced in the feldt-spar, a compound of siliceous, argillaceous, and calcareous earth, intimately united together; which being for ages exposed to the weather, the calcareous part is dissolved, and the siliceous left in form of a white soft earth; though it is uncertain whether this dissolution be performed by means of pure water, or whether an acid be also concerned. Siliceous matter is undoubtedly contained in the water of the boiling fountain of Geyser in Ireland; but he thinks that here it must be dissolved by an alkali, one of the natural solvents of this earth. "It may therefore be asserted (says he), that no siliceous body having the hardness of flint, nor any crystallization of that substance, has ever been formed except by fusion. If by any art this substance shall be dissolved in simple water, or made to crystallize from any solution, in that case the assertion which has been here made may be denied."

H h 2

But

Earth.

³² Strata consolidated by substances insoluble in water.

³³ These probably consolidated by heat and fusion.

³⁴ Siliceous bodies supposed absolutely insoluble by water.

³⁵ Probably dissolved by an alkali in the fountain of Geyser.

Earth.

36
Bodies pe-
netrated by
flinty mat-
ter in fu-
sion.

37
Exempli-
fied in
chalk;

38
In petrified
wood.

39
Why the
wood has
not been
penetrated
by flint in
a state of
solution.

But besides this proof he adduces another, supposed to be more direct; and that is, the penetration of many bodies with a flinty substance, which, according to every collateral circumstance, must have been performed by the flinty matter in a state of simple fusion, and not in a state of suspension by any solvent. Flinty bodies are found perfectly insulated in strata of chalk and sand: and here our author determines that it is *not possible* that flint matter could be conveyed into the middle of these strata by a menstruum in which it was dissolved, and thus deposited in that place, without the smallest trace of deposition in the neighbouring parts. The form of these bodies also demonstrates, in his opinion, "1. That they have been introduced among those strata in a fluid state, by injection from some other place; 2. That they have been dispersed in a variety of ways among those strata then deeply immersed at the bottom of the sea; and, 3. That they have been there congealed from the state of fusion, and have remained in that situation, while those strata have been removed from the bottom of the ocean to the surface of the present land."

There are also specimens brought from many different places, which contain in themselves *the most evident marks of this injection of the flinty substance in a fluid state*; and these are pieces of *fossile wood* brought from England, Germany, and Loch Neagh in Ireland. Sometimes those specimens appear to have been previously penetrated by an irony or calcareous matter, and sometimes not: "the injected flint, however (says he), appears to have penetrated the body of this wood immersed at the bottom of the sea, under an immense compression of water. This appears from the wood being penetrated partially, some parts not being penetrated at all. Now, in the limits betwixt these two parts, we have the most convincing proofs that it had been flint in a simple fluid state which had penetrated the wood, and not in a state of solution."

"*First*, Because, however little of the wood is left unpenetrated, the division is always distinct between the injected part and that which is not penetrated by the fluid flint. In this case the flinty matter has proceeded a certain length, which is marked, and no farther; and beyond this boundary there is no partial impregnation, nor a gradation of the flintifying operation, as there must have been if siliceous matter had been deposited from a solution. *2dly*, The termination of the flinty impregnation has assumed such a form precisely as would have happened naturally from a fluid flint penetrating that body."

"In other specimens of this mineralizing operation, fossile wood, penetrated more or less with ferruginous or calcareous substance, has been afterwards penetrated with a flinty substance. In this case, with whatever different substances the woody body shall be supposed to have been penetrated in a state of solution by water, the regular structure of the plant would still have remained, with its vacuities variously filled with the petrifying substances, separated from the aqueous menstruum, and deposited in the vascular structure of the wood."

"There cannot be a doubt with regard to the truth of this proposition; for, as it is, we frequently find parts of the consolidated wood with the vascular structure remaining perfectly in its natural shape and situation; but if it had been by aqueous solution that the

wood had been penetrated and consolidated, all the parts of that body would be found in the same natural shape and situation.

"This, however, is far from being the case; for while in some parts the vascular structure is preserved entire, it is also evident, that in general the woody structure is variously broken and dissolved by the fusion and crystallization of the flint."

With regard to the second kind of substances to be considered, and which are called by our author *sulphureous*, he tells us, "that they are not soluble in water so far as we know, but fusible by heat, and inflammable by means of heat and vital air. They are either more simple or more compound. The former consist of phlogiston united either with acid or metallic substances, the one forming sulphur, properly so called, the other metals. The more compound kind are composed of oily matter produced by vegetables, and forming bituminous substances."

"Sulphur is found naturally combined with metals, which are said to be mineralized by it; and it is well known that this mineralization is performed by means of heat and fusion; nor will any person skilled in chemistry pretend to say that this is done in the way of aqueous solution. The combination of iron and sulphur, for instance, may be easily performed by fusion; but this compound is resolved into a vitriolic salt by aqueous solution."

Our author further remarks, that unless all the substances of this kind were soluble in water, we ought not to say that any one of them is formed by aqueous solution; for there is such a continued chain of connection between them, that all must have been formed either by aqueous solution or by means of heat and fusion. In one mass, for instance, we find, 1. Pyrites, containing sulphur, iron, and copper: 2. Blend, consisting of iron, sulphur, and calamine: 3. Galena, consisting of lead and sulphur: 4. Marmor metallicum, consisting of terra ponderosa saturated with the vitriolic acid, a substance insoluble in water: 5. A saturation of calcareous earth with the acid of fluor, forming a substance likewise insoluble in water: 6. Calcareous spar of different kinds, being calcareous earth saturated with fixed air, and something also which makes a variety: And, lastly, Siliceous substance, or quartz crystals. Unless, therefore, every one of these different substances were soluble in water, and crystallizable from it, we will look in vain for any explanation of these appearances by means of aqueous solution; while heat being capable of rendering all these substances fluid, they may be with the greatest simplicity transported from one place to another; and they may be made to concrete altogether at the same time, and distinctly separate in any place."

But what puts the matter beyond all doubt with our author, is a specimen of ore taken from an Hungarian mine, and which contains petro-felix, pyrites, and cinabar, so mixed together and crystallized upon one another, that it is impossible to conceive any one of these bodies to have had its fluidity and concretion from a cause which had not affected the other two. "Now (says our author), let those who would deny the fusion of this siliceous body explain how water could dissolve these three different bodies, and deposit them in their present shape. If, on the contrary, they

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40
Of the sul-
phureous
substances.

41
Metals can-
not be mi-
neralized
by aqueous
solution.

42
Exempli-
fied in dif-
ferent sub-
stances.

43
Supposed
proof from
an Hunga-
rian mine.

Earth.

have not the least shadow of reason for such a gratuitous supposition, the present argument must be admitted in its full force."

44

From the existence of native metals in the earth.

The next argument in favour of our author's doctrine is drawn from the existence of metallic bodies in their malleable state in the bowels of the earth. In this situation they are also commonly attended with such evident marks of fusion, that it is impossible to deny their having been really melted; and for the truth of this he appeals, among a thousand instances, to the great native mass of iron found by Dr Pallas in Siberia.

45

Of bituminous bodies.

Oily or bituminous bodies are found variously intermixed with mineral substances, as well as forming distinct strata of themselves. Vegetables afford oily and resinous matters; which being collected at the bottom of the ocean are there formed into strata, afterwards changed by various degrees of heat, and the evaporation of their more fluid parts.

46

Why these bodies are not altered by heat while under water.

"In order to understand this (says our author), it must be considered, that, while immersed in water, and under insuperable compression, the vegetable, oily, and resinous substances would appear to be unalterable by heat; and it is only in proportion as certain chemical separations take place, that those inflammable bodies are changed in their substance by the application of heat. Now, the most general change of this kind is by evaporation, or the distillation of their more volatile parts; by which oily substances become bituminous, and bituminous substances become coaly. There is here a gradation, which is best understood by comparing the two extremes. On the one hand, we know by experiment, that oily and bituminous substances can be melted, and partly changed into vapour by heat; and that they become harder and denser in proportion as the more volatile parts have evaporated from them. On the other hand, coaly substances are destitute of fusibility and volatility, in proportion as they have been exposed to greater degrees of heat, and to other circumstances favourable to the dissipation of their more volatile and fluid parts. If, therefore, in mineral bodies we find the two extreme states of this combustible substance, and also the intermediate states, we must either conclude that this particular operation of heat has been thus actually employed in nature, or we must explain those appearances by some other means in as satisfactory a manner, and so as shall be consistent with other appearances. In this case it will avail nothing to have recourse to the false analogy of water dissolving and crystallizing salts, which has been so much employed for the explanation of other mineral appearances. The operation here in question is of a different nature, and necessarily requires both the powers of heat and proper conditions for evaporation. Therefore, in order to decide the point with regard to what is the power in nature, by which mineral bodies have become solid, we have only to find a bituminous substance in the most complete state of coal, intimately connected with some other substance which is more generally found consolidating the strata, and assisting in the concretion of mineral substances. A most undoubted proof of this kind our author has in his possession, viz. a mass in which are blended together coal of the most fixed kind, quartz, and marmor metallicum. The specimen also

47

Proof that bituminous substances have been consolidated by heat.

is contained in a rock, which every naturalist, he says, will allow to have been produced by fire and fusion.

Earth.

48

Formation of the different kinds of coal.

The strata of fossil coal are found in almost every intermediate state, as well as in those of bitumen and charcoal. Of the former kind is that fossil coal which melts and becomes fluid by heat; of the latter, is that species found both in Wales and Scotland, which is perfectly infusible in the fire, and burns like coaks without flame or smoke. The former abounds in oily matter; the latter has been distilled by heat until it has become a *caput mortuum*, or perfect coal. The more volatile parts of these bodies are sometimes found in their separate state. Thus at Raith in Fifeshire, there is a stratum of limestone, which, though but slightly tinged with a black colour, contains bituminous matter like pitch, in many cavities which are lined with calcareous spar crystallized. Now, it is to be observed, that had the cavity in the solid limestone or marble, which is lined with calcareous crystals containing pyrites, been thus incruited by means of filtration with water, this water must have dissolved calcareous spar, pyrites, and bitumen. But these natural appearances would not even be solved by this hypothesis of dissolution and filtration of these substances. There is also required, first, a cause for the separation of these different substances from the aqueous menstruum. 2. An explanation of the way in which a bitumen should be formed into hard round bodies (our author has a specimen of this kind) of the most solid structure; and, lastly, some probable means for this complicated operation being performed below the bottom of the ocean, in the close cavity of a marble stratum.

49

Stratum containing liquid bituminous matter in Fifeshire.

Having thus run through his course of argument for the probability of the strata of earth being formed by heat and fusion rather than by aqueous solution, our author proceeds to the examination of a phenomenon in the mineral kingdom, which may be thought inconsistent with what he has advanced; viz. the existence of great masses of salt in the bowels of the earth. On this subject he observes, that the formation of masses of salt at the bottom of the sea, without the assistance of subterranean fire, is not a thing un-supposable as at first sight might appear. "Let us but suppose a rock placed across the gut of Gibraltar (a case nowise unnatural), and the bottom of the Mediterranean would be certainly filled with salt; because the evaporation from the surface of that sea exceeds the measure of its supply. But strata of salt formed in this manner at the bottom of the sea are as far from being consolidated by means of aqueous solution as a bed of sand in the same situation; and we cannot suppose the consolidation of such a stratum of salt by means of water, without supposing subterranean heat employed to evaporate the brine which would successively occupy the interstices of the saline crystals. But this, it may be observed, is equally departing from the natural operation of water as the means for consolidating the sediment of the ocean, as if we were to suppose the same thing done by heat and fusion. For the question is not, if subterranean heat be of sufficient intensity for the purpose of consolidating strata by the fusion of their substances? but, whether it be by means of this agent, subterranean heat, or by water alone, without the operation of a

50

On the production of fossil salt by fusion.

melting.

Earth. melting heat, that those materials have been variously consolidated?"

51
From the appearance of the salt-rock in
Cheshire.

The Doctor now attempts to prove, from the appearance of the saline strata, that they have been formed by subterraneous heat and fusion as well as the others. "The salt-rock in Cheshire lies in strata of red marl. It is horizontal in its direction, and is dug 30 or 40 feet deep. The body of this rock is perfectly solid, and the salt in many places pure, colourless, and transparent, breaking with a sparry, cubical texture: but the greatest part is tinged by the admixture of the marl, and that in various degrees, from the slightest tinge of red to the most perfect opacity. Thus the rock appears as if it had been a mass of fluid salt, in which had been floating a quantity of marly substance not uniformly mixed, but every where separating and subsiding from the saline substance. There is also to be observed a certain regularity in the separation of the tinging from the colourless substance; which, at a proper distance, gives to the perpendicular section of the rock a distinguishable figure in its structure. When looking at this appearance near the bottom of the rock, it first presented the figure of regular stratification; but upon examining the whole mass of rock, this stratification was found only to take place near the bottom. At the top of the rock, the most beautiful figure, though the most distant from stratification, was observed. It was all composed of concentric circles, and these appeared to be the section of a mass made up entirely of concentric spheres, like those beautiful systems of configuration which agates so frequently present us with in miniature. In about eight or ten feet from the top, the circles growing large, were blended together, and gradually lost their regular appearance, until at a greater depth they again assumed that of a regular stratification. This regular arrangement of the floating marly substance in the body of the salt, which is that of the structure of a coated pebble, or that of concentric spheres, is altogether inexplicable upon any other supposition than the perfect fluidity or fusion of the salt, and the attractions and repulsions of the contained substances. It is in vain to look in the operations of solution and evaporation for that which nothing but perfect fluidity and fusion can explain.

52
From the mineral alkali on Te-
neriff.

"This example of a mineral salt congealed from a melted state, may be confirmed by another argument suggested by Dr Black, viz. an alkaline salt found in a mineral state, and described in the Philosoph. Transac. for 1771. The fossil alkali crystallizes from a dissolved state, in combining itself with a large quantity of water, in the manner of alum: and in this case the water is essential to the constitution of that solid crystalline body; for, upon the evaporation of the water, the transparent salt loses its solidity, and becomes a white powder. If, instead of being gently dried, the crystalline salt is suddenly exposed to a sufficient degree of heat (that is, somewhat more than the heat of boiling water), it enters into the state of aqueous fusion, and boils, emitting the water by means of which it had been crystallized in the cold, and rendered fluid in that heated state. It cannot be crystallized from a dissolved state without the combination of that quantity of water; nor can that water be separated without destroying its crystalline state. But in this mineral specimen we have a solid crystalline salt, with a

structure which, upon examination, appears to be sparry and radiated like the zeolite. It contains no water in its crystallization, but melts in a sufficient heat without any aqueous fusion. Therefore this salt must have been in a fluid state of fusion immediately before its congelation and crystallization.

"Another example may be drawn from the iron-⁵³ stone, which is commonly found among the argillaceous strata attendant upon fossil coal, both in Scotland and England. This stone is generally found among the bituminous schistus or black argillaceous strata, either in separate masses of various shapes and sizes, or forming of itself strata which are more or less continuous in their direction among the schistus or argillaceous beds. This mineral contains in general from 40 to 50 per cent. of iron, and it loses near one-third of its weight in calcination. Before calcination it is of a grey colour, is not penetrable by water, and takes a polish. In this state therefore it is perfectly solid; but being calcined, it becomes porous, red, and tender. The fact to be proved with regard to these iron stones is, that they have acquired their solid state from fusion, and not in concreting from any aqueous solution. A species of this kind of stone is found at Aberlady in East Lothian, resembling an oblate or much compressed sphere, and the size from two or three inches diameter to more than a foot. In the circular or horizontal section they present the most elegant septarium: and from the examination of this particular structure, the following conclusions may be drawn.

"1. That the septa have been formed by the uni-⁵⁴form contraction of the internal parts of the stone, supposed to have received its form by fusion. the volume of the central parts diminishing more than that of the circumference; by which means the separations of the stone diminish in a progression from the centre towards the circumference.

"2. There are only two ways in which the septa must have received the spar with which they are filled more or less; either, first, by insinuation into the cavity of these septa after they were formed; or, secondly, by separation from the substance of the stone at the same time that the septa were forming.

"Were the former of these suppositions true, ap-⁵⁵pearances would be observable, showing that the sparry substance had been admitted either through the porous structure of the stone, or through proper apertures communicating from without. Now, if either of these had been the case, and the stone had been consolidated from no other cause than concretion from a dissolved state, that particular structure of the stone by means of which the spar had been admitted must appear at present upon an accurate examination. This, however, is not the case; and we might rest the argument here: The septa reach not the circumference; the surface of the stone is solid and uniform in every part; and there is not any appearance of the spar in the argillaceous earth around the stone. It therefore necessarily follows, that the contraction of the iron-stone, in order to form the septa, and the filling the cavities with spar, had proceeded *pari passu*; and that this operation must have been brought about by means of fusion or by congelation from a state of simple fluidity and expansion.

"There is one fact more, which is well worth our attention; viz. the crystallizations which are found in close

Earth. close cavities of the most solid bodies. These concretions are well known to naturalists, and form part of the beautiful specimens which are to be found in the cabinets of collectors, and which the German mineralists have named *drusen*." Our author, however, considers only one of these species, which is of the agate kind. It belongs to the kind of stones frequent in this country, which are commonly called *pebbles*. Many of them are filled with a siliceous crystallization, which evidently proceeds from the circumference towards the centre. Many of them again are hollow. They are uniformly lined with crystallized substances; and it is proper to attend to this circumstance, that the cavity is perfectly inclosed with many solid coats impervious to air or water; but particularly with the external cortical part, which is extremely hard, takes the highest polish, and is of the most perfect solidity, admitting nothing but the passage of light and heat.

56
Of crystallizations in cavities of solid bodies.
57
Particular kind of druse described.
58
Other mineral crystallizations described.

"Within these cavities we find, first, the coats of crystals with which this cavity is always lined: and this is general to all substances concreting in similar circumstances from a state of fusion; for when thus at liberty they naturally crystallize. 2. We have frequently a subsequent crystallization set upon the first, and more or less immersed in it. 3. There is also sometimes a third crystallization superincumbent on the second, in like manner as the second was upon the first. Our author has one specimen in which the primary crystals are siliceous; the second thin foliaceous crystals of deep red but transparent ore, forming elegant figures that have the form of roses; the tertiary crystallization is a frosting of small siliceous crystals upon the edges of the foliaceous crystals. In other specimens there is first a lining of colourless siliceous crystals, then another lining of amethystine crystals, and sometimes within that fuliginous crystals. Upon these fuliginous and amethystine crystals are many spherules or hemispheres of red compact iron-ore like hematites. In others again, the primary crystals are siliceous, and the secondary calcareous. Of this kind there is one in the Doctor's possession, which has upon the calcareous crystals beautiful transparent siliceous crystals, and iron spherules upon these. He has also an agate formed of various red and white coats, and beautifully figured. The cavity within the coated part of the pebble is filled up without vacuity; first with colourless siliceous crystals; secondly, with fuliginous crystals; and, thirdly, with white or colourless calcareous spar. But between the spar and crystals there are many spherules, seemingly of iron, half sunk into each of these two different substances."

From the foregoing facts our author now draws the following conclusions.

59
Conclusions concerning the fused state of the minerals.

"1. That concretion had proceeded from the surface of the agate inwards. This necessarily follows from the nature of those figured bodies, the figures of the external coats always determining the shape of those within, and never contrariwise, those within affecting those without.

"2. That when the agate was formed, the cavity then contained every thing which is now found in it, and nothing more.

"3. That the contained substances must have been in a fluid state, in order to their crystallizing.

"4. That as this fluid state had not been the effect

of solution in a menstruum, it must have been fluidity from heat and fusion."

This is the substance of all the evidence brought by Dr Hutton in support of his doctrine, that most of the mineral substances with which the strata are conjoined must have been produced by subterraneous heat, and not from any aqueous solution. Thus far he thinks it is perfectly conclusive, though not altogether so with regard to the formation of the strata themselves: but, in order to make it apply also to these, he next proposes to give examples of strata consolidated without the introduction of foreign matter, merely by the softening or fusion of their own materials.

For this purpose he considers the calcareous and siliceous strata, which are the two so much prevalent on the surface of the globe, that all others, according to him, may be considered as nothing: "for (says he) unless it be the bituminous or coal strata, there is hardly any other which does not contain more or less of one or other of these two substances. If therefore it can be shown, that both of these two general strata have been consolidated by the simple fusion of their substance, no desideratum or doubt will remain with regard to the nature of that operation which has been transacted at great depths of the earth, places to which all access is denied to mortal eyes.

"We are now to prove, 1. That those strata have been consolidated by simple fusion; and, 2. That this operation is universal in relation to the strata of the earth, as having produced the various degrees of hardness or solidity in these bodies.

"I shall first remark, that a fortuitous collection of hard bodies, such as gravel and sand, can only touch in points, and cannot while in that hard state be made to correspond so precisely to each other's shape as to consolidate the mass. But if these hard bodies should be softened in their substance, or brought into a certain degree of fusion, they might be adapted mutually to each other; and thus consolidate the open structure of the mass. Therefore, to prove the present point, we have but to exhibit specimens of siliceous and calcareous strata which have been evidently consolidated in this manner. Of the first kind great varieties occur in this country. They are the consolidated strata of gravel and sand, often containing abundance of feldspar, and thus graduating into granite; a body, in this respect, perfectly similar to the more regular strata which we now examine. The second kind again are less common, unless we consider the shells and coralline bodies of our limestones as exhibiting the same example, which indeed they do. But I have a specimen of marble from Spain which will afford the most satisfactory evidence of the fact in question. This Spanish marble may be considered as a species of pudding-stone; a species of marble which, from Mr Bowles's Natural History, appears to be very common in Spain. The gravel of which this marble is composed consists of fragments of other marbles of different kinds. Among these are different species of zeolites, marble, some shell marbles, and some composed of a chalky substance, or of undistinguishable parts. But it appears that all these different marbles had been consolidated or made hard, then broken into fragments, rolled and worn by attrition; and thus collected together, along with some sand or small siliceous bodies,

into

Earth.

60

The doctrine of fusion applied to the formation of the strata.

61

Universal prevalence of the calcareous and siliceous strata.

62

Consolidation of a stratum from a fortuitous collection of hard bodies.

63

Spanish marble described.

Earth. into one mass. Lastly, this compound body is consolidated in such a manner as to give the most distinct evidence that this had been executed by the heat of simple fusion.

64
Proof of
this having
been in a
state of fu-
sion.

"The proof is, that, besides the general conformation of those hard bodies, so as to be perfectly adapted to each other's shape, there is in some places a mutual indentation, which resembles perfectly the junction of the different bones of the cranium; and which must necessarily have required a mixture of those bodies while in a soft or fluid state.

"This appearance of indentation is by no means singular or limited to one particular specimen. I have several specimens of different marbles, in which fine examples of this species of mixture may be perceived. But in this particular case of the Spanish pudding-stone, where the mutual indentation is made between two pieces of hard stone worn round by attrition, the softening or fusion of these two bodies is not simply rendered probable, but demonstrated.

"Having thus proved, that those strata had been consolidated by simple fusion, as proposed, we now proceed to show, that this mineral operation had been not only general but universal, in consolidating our earth in all the various degrees, from loose and incoherent shells and sand to the most solid bodies of the siliceous and calcareous substances.

65
The same
doctrine
exemplified
in chalk.

"To exemplify this in the various collections and mixtures of sands, gravels, shells, and corals, were endless and superfluous. We shall only take for an example one simple homogeneous body, in order to exhibit it in the various degrees of consolidation, from the state of simple incoherent earth to that of the most solid marble. The substance meant is chalk, naturally a soft calcareous earth, but which may be found consolidated in every different degree.

66
Account of
a ridge of
indurated
chalk run-
ning thro'
the isle of
Wight.

"Through the middle of the isle of Wight there runs a ridge of hills of indurated chalk. This ridge runs from the isle of Wight directly west into Dorsetshire, and goes by Corfe Castle towards Dorchester, perhaps beyond that place. The sea has broke through this ridge at the west end of the isle of Wight, where columns of the indurated chalk remain, called the *Needles*; the same being found on the opposite shore in Dorsetshire. In this field of chalk we find every gradation of this soft earthy substance to the most consolidated body of this indurated ridge, which is not solid marble, but which has lost its chalky property, and acquired a kind of stony hardness.

67
Another in
Ireland.

"We have this cretaceous substance in its most indurated and consolidated state in the kingdom of Ireland, not far from the Giant's Causeway; and it affords the most perfect evidence of this body having been once a mass of chalk, which is now a body of solid marble. Thus, if it is by means of fusion that the strata of the earth have in many places been consolidated, we must conclude that all the degrees of consolidation, which are indefinite, have been brought about by the same means.

68
Granite al-
so consoli-
dated by
fusion.

"It may, however, still be alleged, that there is a great part of the solid mass of this earth not properly comprehended among those bodies which have been thus proved to be consolidated by means of fusion. This is granite; a mass which is not generally stratified, and which being a body perfectly solid, and

N^o 107.

forming some parts in the structure of this earth, deserves to be considered. The nature of the granite is too intricate a subject to be here considered: we shall therefore only now take notice of one species; and if this appears to have been once in a state of fusion, we must conclude that all the rest have been so too.

The species in question comes from Portsoy, on the road to Huntley; and is partly a porphyry and partly a granite. The singularity of it, however, consists not in the nature or proportions of its constituent parts, but in the uniformity of the sparry ground, and the regular shape of the quartz mixture. This siliceous substance, viewed in one direction, or longitudinally, may be considered as columnar, prismatical, or continued in lines running nearly parallel. These columnar bodies of quartz are beautifully impressed with a figure on the sides, where they are in contact with the spar. This figure is that of furrows or channels, which are perfectly parallel, and run across the longitudinal direction of the quartz. This striated figure is only seen when, by fracture, the quartz is separated from the contiguous spar. But what is more particularly to be noticed is, that the transverse section of those longitudinal bodies not only have separately the forms of certain typographical characters, but collectively give the regular linear appearance of types set in writing.

"It is evident from the inspection of this fossil, that the sparry and siliceous substances had been mixed together in a fluid state; and that the crystallization of the sparry substance, which had been rhombic, had determined the regular structure of the quartz, at least in some directions. Thus the siliceous substance is to be considered as included in the spar, and as figured according to the laws of crystallization proper to the sparry ground; but the spar is also to be found included in the quartz. Now it is not possible to conceive any other way in which these two substances, quartz and feldt-spar, could be thus concreted, except by congelation from a fluid state, in which they had been mixed."

Our author having at length finished his arguments on the formation of the strata, draws the following general conclusion. "If it be by means of heat and fusion that strata have been consolidated, then, in proportion to the degree of consolidation they have undergone from their original state, they should, *ceteris paribus*, abound with more separations in their mass. But this conclusion is not found consistent with appearances. A stratum of sand-stone does not abound so much with cutters or veins as a similar stratum of marble, or even a similar stratum of sand-stone that is more consolidated. In proportion therefore as strata have been consolidated, they are in general intersected with veins and cutters; and in proportion as strata are deep in their perpendicular section, the veins are wide, and placed at greater distances. In like manner, when strata are thin, the veins are many, but proportionally narrow.

"It is thus upon chemical principles to be demonstrated, that all the solid strata of the globe have been condensed by means of heat and hardened from a state of fusion. But this proposition is equally to be maintained from propositions that are mechanical. The strata of the globe, besides being formed of earths, are composed of gravel, sand, and fragments of hard bodies;

Earth.

69

Description
of a species
from Port-
soy.

70

Veins of
the strata
numerous
in propor-
tion to
their con-
solidation.

71

Strata con-
posed of
the frag-
ments of
others.

Earth.

dies; all of which may be considered as in their nature simple; but these strata are also found composed of bodies which are not simple, but are fragments of former strata which had been consolidated, and afterwards were broken and worn by attrition so as to make gravel. Strata composed in this manner have been again consolidated; and now the question is, By what means?

72
Could not
be consoli-
dated by a
queous dis-
solution.

"If strata composed of such various bodies had been consolidated, by any manner of concretion, from the fluidity of a dissolution, the hard and solid bodies must be found in their entire state, while the interstices between those constituent parts of the stratum are filled up. No partial fracture can be conceived as introduced into the middle of a solid mass of hard matter without having been communicated from the surrounding parts. But such partial separations are found in the middle of those hard and solid masses; therefore this compound body must have been consolidated by other means than that of concretion from a state of solution.

73
Must have
undergone
a fusion by
fire.

"The Spanish marble already described, as well as many consolidated strata of siliceous gravel, afford the clearest evidence of this fact. These hard bodies are perfectly united together in forming the most solid mass; the contiguous parts of some of the rounded fragments are interlaced together, as has already been observed; and there are partial shrinkings of the mass forming veins traversing several fragments, but perfectly filled with the sparry substance of the mass, and sometimes with parts of the stone distinctly floating on the transparent body of the spar. Now there is not in nature any known power, besides heat and fusion, by which these effects might be produced. But such effects are general to all consolidated masses, although not always so well illustrated in a cabinet specimen."

74
How the
strata have
been eleva-
ted from
the bottom
of the o-
cean.

Thus the formation of the strata is supposed to be fully discussed: after which our author goes on to consider the means by which they have been elevated from the bottom of the ocean; for he looks upon it as an undoubted fact, that the highest points of our land have been for ages at the bottom of the ocean. "It is a truth unquestionable (says he), that what had been originally at the bottom of the sea, is at present the highest of our land. In explaining this appearance, therefore, no other alternative is left, but either to suppose strata elevated by the power of heat above the level of the present sea, or the surface of the ocean reduced many miles below the height at which it had subsisted during the collection and induration of the land which we inhabit. Now if, on the one hand, we are to suppose no general power of subterraneous fire or heat, we leave to our theory no means for the retreat of the sea or the lowering of its surface. If, on the other, we are to allow the general power of subterraneous heat, we cannot have much difficulty in supposing either the surface of the sea to have subsided, or the bottom of the ocean in certain parts to have been raised by a subterranean power above the level of its surface, according as appearances shall be found to require the one or the other of these conclusions.

"The strata formed at the bottom of the ocean are necessarily horizontal in their position, or nearly so; and continuous in their horizontal direction and extent. They may change, and gradually assume the

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nature of each other so far as concerns the materials of which they are formed; but there cannot be any sudden change, fracture, or displacement naturally in the body of a stratum. But if these strata are cemented by the heat of fusion, and erected with an expansive force acting below, we may expect to find every species of fracture, dislocation, and contortion in those bodies, and every degree of departure from a horizontal towards a vertical position. The strata of the globe are actually found in every possible position: for from horizontal, they are frequently found vertical; from continuous, they are broken and separated in every possible direction; and from a plane, they are bent and doubled. It is impossible they could have been formed by the known laws of nature in their present state and position. And here the apparent irregularity and disorder of the mineral regions are as instructive, with regard to what had been transacted in a former period of time, as the order and regularity of these same regions are conclusive in relation to the place in which a former state of things had produced that which, in its changed state, we now perceive.

Earth.

75
Strata
found bro-
ken and
disjoined in
every possi-
ble posi-
tion.

"We are now to conclude, that the land on which we dwell had been elevated from a lower situation by the same agent which had been employed in consolidating the strata, in giving them stability, and preparing them for the purpose of the living world. This agent is matter actuated by extreme heat, and expanded with amazing force. If this has been the case, it will be reasonable to expect that some of the expanded matter might be found condensed in the bodies which have been heated by that igneous vapour, and that matter foreign to the strata may have been thus introduced into the fractures and separations of those indurated masses. We have but to open our eyes to be convinced of this truth. Look into the sources of our mineral treasures; ask the miner from whence has come the metal into his vein? Not from the earth or air above; not from the strata which the vein traverses. There is but one place from whence these minerals may have come; and that is, the bowels of the earth; the place of power and expansion; the place from whence must have proceeded that intense heat by which loose materials have been consolidated into rocks, as well as that enormous force by which the regular strata have been broken and displaced."

76
Have been
raised by
the force of
fire.

77
Proved
from the
inspection
of mines.

Our author is of opinion, that this action of heat is likewise evident from an inspection of the materials with which the veins are filled, as well as their various fractures and irregularities; and informs us, that some great mechanical power must have been employed in filling these veins, as well as that necessarily employed in making the first fracture and divulsion. The successive irruptions of fluid substances into the veins, he says, is demonstrable from the mere inspection of the veins and their contents, it being very common to see three successive series of these operations; "all which may be perceived in a small fragment of a stone, which a man of science may examine in his closet, often better than by descending to the mine where all the examples are found on a large scale."

78
A great
mechanical
power re-
quisite to
fill the
veins with
the matter
they con-
tain.

79
Successive
irruptions
of fluid
matter in-
to them.

These fiery operations, he contends, are not to be accounted any way accidental, but as entirely natural to the globe, and remain at this day with undiminished force: and of this he brings a proof from the eruptions

I i

tions

Earth.
80
Sicilian jasper once in a state of fusion.
81
Heat of volcanoes the renovating power of the earth.

tions of mount *Ætna*, informing us, that he has in his possession a table of Sicilian jasper, which evidently shows that this calcareous stone had flowed and been in such a state of fusion as lava is.

This subterraneous heat manifested in the burning mountains is the renovating power which the earth possesses within itself, and which prevents it from coming to an end by reason of the perpetual waste taken notice of n^o 22. "Volcanoes (says he) are natural to the globe as general operations; but we are not to consider nature as having a burning mountain for an end in her intention, or as a principal purpose in the general system of this world. The end of nature in placing an internal fire or power of heat, and a force of irresistible expansion in the body of this earth, is to consolidate the sediment collected at the bottom of the sea, and to form thereof a mass of permanent land above the level of the ocean, for the purpose of maintaining plants and animals. The power appointed for this purpose is, as on all other occasions where the operation is important, and where there is any danger of a shortcoming, wisely provided in abundance; and there are contrived means for disposing of the redundancy. These, in the present case, are our volcanoes.

82
Volcanoes to be considered as spiracles to the subterraneous heat.

"A volcano is not made on purpose to frighten superstitious people into fits of piety and devotion, nor to overwhelm devoted cities with destruction: A volcano should be considered as a spiracle to the subterraneous furnace, in order to prevent the unnecessary elevation of land and fatal effects of earthquakes; and we may rest assured, that they in general wisely answer the end of their intention, without being in themselves an end for which nature had exerted such amazing power and contrivance."

83
Are only proper for elevating land from the bottom of the sea.

The Doctor then goes on to show, that volcanoes are not proper for elevating land, unless placed at the bottom of the sea, where the contact of the water tends to close the orifice, and to accumulate matter upon the weakest part. An instance of this was given in the year 1707, when the burning island arose in the Mediterranean; and he confirms his theory by the great number of melted matters which are every where to be found in the strata, even of countries where no volcanoes exist at present. Examples are brought from the dykes of whinstone, as they are called in this country, and which he supposes to have been once in a state of fusion.

84
Whin-stone supposed to have been in a state of fusion.

85
Difference between erupted and unerupted lavas.

In order to avoid an objection which might here arise from the difference betwixt the appearance of our whinstone and the lavas of volcanoes, our author makes a distinction between such as have been erupted at the moment of explosion, and those which had been melted under a vast compression of weighty materials, and at last exposed to the air after the lapse of a number of ages. "In the erupted lavas, those substances which are subject to calcine and vitrify in our fires, suffer similar changes when delivered from a compression which had rendered them fixed, though in an extremely heated state. Thus a lava in which there is much calcareous spar, when it comes to be exposed to the atmosphere, or delivered from the compressing force of its confinement, effervesces by the explosion of its fixed air; the calcareous earth at the same time vitrifying with the other substances. Hence such violent ebullition in volcanoes, and hence the e-

86
Ebullition in volcanoes owing to the extrication of fixed air.

mission of so much pumice stone and ashes which are of the same nature. In the body of our whinstone, on the contrary, there is no mark of calcination or vitrification. We frequently find in it much calcareous spar, or the *terra calcarea aerata*, which had been in a melted state by heat, and had been crystallized by congelation into a sparry form. This is the cause of the differences between the erupted lavas and our whinstone, toadstone, and the Swedish trap; which may be called *subterranean lavas*."

All this time our author seems to have excluded from his system every idea of accounting for the origin of metals; though this would seem to be no less necessary than to account for that of whinstone. At last, however, we are informed that there are peculiar productions in the mineral kingdom which are rare, as being found only in few places; and of these he enumerates the diamond of the east, the platina of the west, and the tin of Cornwall, Germany, and Sumatra. "But all these substances (gold itself not excepted)," says he, "are to be considered as the vapours of the mineral regions condensed occasionally in the crevices of the land."

Earth.
87
Composition of whin-stone described.

88
Strange account of the origin of metals.

The last part of our author's dissertation contains the system of decay and renovation observed in the earth. In this having again observed what had been already repeated over and over, that the land we see at present had been formed at the bottom of the sea, he proceeds to inform us, that, "at a gross computation, there may perhaps be a fourth part of our solid land which is composed from the matter that had belonged to these animals. Now what a multitude of living creatures, what a quantity of animal economy, must have been required, for producing a body of calcareous matter which is interspersed throughout all the land of the globe, and which certainly forms a very considerable part of the mass! Therefore, in knowing how these animals had lived, or with what they had been fed, we shall have learned a most interesting part of the history of the earth; a part which it is necessary to have ascertained, in order to see the former operations of the globe, while preparing the materials of the present land."

89
System of decay and renovation in the earth.

90
A fourth part of the land supposed to proceed from marine animals.

Before entering upon this subject, however, he still thinks it necessary to consider some other of the component parts of the strata of our present earth. These are gravel, sand, and clay. Gravel, he tells us, is no other than stones worn round by their attrition in water; and finding them in the composition of our land, we must conclude, that in the former earth there had been operations of wind and water similar to those which we behold at present; and by which new gravel is continually prepared, as well as old gravel consumed or diminished by attrition upon our shores. Sand is no other than small particles of hard and solid bodies worn round by attrition. Clay is a mixture of different earths or hard substances in an impalpable state; and these substances are chiefly the siliceous and aluminous earths. Others are occasionally mixed in clays; or perhaps always to be found in some small portion. But the great quantity of siliceous, argillaceous, and other compound substances, in form of earth or other impalpable sediment, corresponds perfectly with that quantity of these same substances which must have been prepared in the formation of so much gravel.

91
Gravel, sand, and clay considered.

Earth. gravel and sand, by the attrition of these bodies in the moving waters.

92 Conjectures concerning the former earth. From these considerations our author tells us, that we have reason to conclude there had been in the former earth such operation as we see at present; and likewise that it had been composed of similar materials. The animals which had formerly existed, also appear by their remains to have been similar to what they are now; and it is also probable that their food had been derived from the same origin, viz. vegetables. There must therefore have existed in the former earth a world of vegetables, as well as a world of animals and an ocean. The existence of these he determines from the many specimens of fossil wood and petrified plants to be met with; and its profusion he thinks is evidenced from the quantities of mineral coal: of which he says, that "nothing can be more certain than that all the coaly or bituminous strata have had their origin from the substance of vegetable bodies that grew upon the land."

93 Coal supposed to have been derived from wood.

94 Of the diminution of our present land. Lastly, when he comes to speak of the actual diminution of the earth we at present inhabit, he proceeds in the following manner: "Our land has two extremities; the tops of the mountains on one hand, and the sea-shore on the other. It is the intermediate space between these two that form the habitation of plants and animals. While there is a sea, shore, and a high ground, there is that which is required in the system of the world; take these away, and there would remain an aqueous globe, in which the world would perish. But, in the natural operations of the world, the land is perishing continually; and this is what we now want to understand."

"Upon the one extremity of our land there is no increase, nor any occasion of mineral substance. That place is the mountain top, on which nothing is observed but continual decay. The fragments of the mountain are removed in a gradual succession from the highest station to the lowest. Being arrived at the shore, and having entered the dominion of the waves in which they find perpetual agitation, these hard fragments, which had eluded the resolving powers natural to the surface of the earth, are incapable of resisting the powers here employed for the destruction of the land. By the attrition of one hard body upon another, the moving stones and rocky shores are mutually impaired; and that solid mass, which of itself had potential stability against the violence of the waves, affords the instruments of its own destruction, and thus gives occasion to its actual instability."

95 No perceptible progress made in the dissolution of this earth.

Having thus described very particularly the means by which the destruction of the present earth is going on, it is natural to inquire what progress has been made in the work. But in this neither ancient nor modern history give any assistance. The strait between Italy and Sicily he confesses to be no wider; the isthmus of Corinth to be no narrower; nor the rock on which the famous tower of Pharos was erected, either larger or smaller than before. The Palus Mæotis in the time of Polybius appeared to be very near filling up, as that historian informs us; and so it continues to appear at this day, without any apparent progress having been made in it. In short, the whole of our author's researches can produce nothing more than the loss of a small island in the mouth of the harbour

of New Carthage, which, Polybius says, existed in his time; and for which there is now only a rock under water. Our author therefore is obliged at last to own, that the quantity of decay in the rocks he speaks of, has either been too small for human observation, or, which is more probable, that no accurate measurement of the subject by which this quantity of decrease might be ascertained had been taken and recorded. "To sum up the argument, therefore (says he), we are certain, that all the coasts of the present continents are wasted by the sea, and constantly wearing away upon the whole; but this operation is so extremely slow, that we cannot find a measure of the quantity in order to form an estimate. Therefore the present continents of the earth, which we consider as in a state of perfection, would, in the natural operations of the globe, require a space indefinite for their destruction. But in order to produce the present continents, the destruction of a former vegetable world was necessary; consequently the production of our present continents must have required a time which is indefinite. In like manner, if the former continents were of the same nature with the present, it must have required another space of time, which is also indefinite, before they had come to their perfection as a vegetable world."

"It is necessary, however, that the present land should be worn away and wasted exactly in proportion as new land shall appear; or conversely, that an equal proportion of new land should always be produced as the old is made to disappear. It is only required, that at all times there should be a just proportion of land and water upon the surface of the globe, for the purpose of a habitable world. Neither is it required, in the actual system of this earth, that every part of the land should be dissolved in its structure, and worn away by attrition, so as to be floated in the sea. Parts of the land may often sink in a body below the level of the sea, and parts again may be restored, without waiting for the general circulation of land and water; which proceeds with all the certainty of nature, but which advances with an imperceptible progression. Many such apparent irregularities may appear without the least infringement on the general system. That system is comprehended in the preparation of future land at the bottom of the ocean, from those materials which the dissolution and attrition of the present land may have provided, and from those which the natural operations of the sea afford."

"We have been now supposing, that the beginning of our present earth had been laid in the bottom of the ocean at the completion of the former land; but this was only for the sake of distinctness. The just view is this, that when the former land of this globe had been complete, so as to begin to waste and be impaired by the encroachment of the sea, the present land began to appear above the surface of the ocean. In this manner we suppose a due proportion of land and water to be always preserved upon the surface of the globe for the purpose of a habitable world, such as we possess. We thus also allow time and opportunity for the translation of animals and plants to occupy the earth. But if the earth on which we live began to appear on the ocean at the time when the last began to be resolved, it could not be from the materials

Earth.

96 immense space of time required for the destruction and reproduction of the dry land.

97 Of the manner of their dissolution and production.

Earth.
98
Present
earth con-
structed
from the
materials of
the third
before it.

materials of the continent immediately preceding this which we examine, that the present earth had been constructed: for the bottom of the ocean must have been filled with materials before land could be made to appear above its surface.—Let us suppose, that the continent which is to succeed our land is at present beginning to appear above the water in the middle of the Pacific Ocean; it must be evident, that the materials of this great body, which is formed, and ready to be brought forth, must have been collected from the destruction of an earth which does not now appear. Consequently in this true statement of the case, there is necessarily required the destruction of an animal and vegetable earth prior to the former land; and the materials of that earth which is first in our account, must have been collected at the bottom of the ocean, and begun to be concocted for the production of the present earth, when the land immediately preceding the present had arrived at its full perfection. This, however, alters nothing with regard to the nature of those operations of the globe; the system is still the same. It only protracts the indefinite space of time in its existence, while it gives us a view of another distinct period of the living world; that is to say, the world which we inhabit is composed of the materials, not of that which was the immediate predecessor of the present, but of the earth which, in ascending from the present, we consider as the third, and which had preceded the land that was above the surface of the sea while our present land was yet beneath the water of the ocean. Here are three distinct successive periods of existence; and each of them is, in our measurement of time, a thing of indefinite duration. We have now got to the end of our reasoning; we have no data further to conclude immediately from that which actually is; but we have got enough. If the succession of worlds is established in the system of nature, it is in vain to look for any thing higher in the origin of the earth. The result therefore of our present inquiry is, that we find no vestige of a beginning, no prospect of an end.”

99
Eternity of
the world
the final
result of
this theory.

100
White-
hurst's the-
ory.

VI. Though the theory of which we have now given such a large abstract is the most laboured and complete that hath yet appeared, it is still necessary to take notice of some other attempts, though perhaps less calculated to draw the attention of the public than that of Dr Hutton. One of these is by Mr Whitehurst; of which the following is the most material part of an abstract given by himself at the end of his work.

101
The globe
originally
in a fluid
state.

“1. The globe we now inhabit was originally in a state of fluidity; and that not owing to any dissolvent principle or subsequent solution, but to the first assemblage of its component parts. Whence it is presumed, that the earth had a beginning, and has not existed from eternity, as some have imagined; though the precise number of ages it has existed have not yet been actually determined.”

102
Proved
from its
spheroidal
figure.

The proof given by our author of this original fluidity of the earth rests entirely upon its oblate spheroidal form; which a fluid globe may easily be supposed to assume, though we cannot conceive how a solid one should do so.

103
Its parts
blended to-
gether into
a soft pulp.

2. “The fluidity of the earth, and the infinite divisibility of matter, evidently show, that the component parts of air, earth, water, &c. were uniformly

blended together, none being heavier or lighter than another; whereby they composed an uniform mass or pulp, of equal consistence in every part, from its surface to its centre: consequently the new formed globe was unfit for animal or vegetable life; and therefore it would seem extremely absurd to suppose that either the one or the other were created during the chaotic state of the earth, or prior to its being formed into an habitable world: therefore the presumption is great, that mankind were not created till the earth was become suitable to the nature of their existence.”

The proof of this position is laid down in the following manner. “It is a truth universally known, that the component parts of the most dense bodies become suspended in whatever menstrua they are dissolved; as for instance, the particles of gold in aqua-regia, silver in aquafortis, salts in water, and water in air. Nay, we may likewise add, that the component parts of mercury, in the act of distillation, become suspended in air, notwithstanding the specific gravity of the former is to that of the latter as 11,000 to 1 nearly. Such, therefore, are the consequences arising from the infinite divisibility of matter, none being heavier or lighter than another when thus reduced to their original elementary principles.”

104
Proved
from the
solution of
metals in
acids, &c.

3. “The component parts of the chaos were heterogeneous, or endowed with peculiar laws of *elective attraction*; whereby similar bodies are disposed to unite and form select bodies of various denominations, as air, water, earth, &c.: by means of these principles the chaos was progressively formed into an habitable world.

105
Parts of the
chaos en-
dowed with
various at-
tractions.

“But the first operation which presents itself to our consideration is the oblate spheroidal figure of the earth, acquired from its diurnal rotation, and the laws of gravity, fluidity, and centrifugal force; which was no sooner completed, than the component parts began to act more freely, according to their affinities: hence the particles of air united to those of air, those of water to water, and those of earth to earth; and with their union commenced their specific gravities, and destroyed that uniform suspension which had hitherto prevailed throughout the chaotic mass. Thus commenced the separation of the component parts; for those of the greatest density began their approach toward the centre of gravity; and those of the greatest levity ascended towards the surface: therefore, as air is nearly 800 times lighter than water, the presumption is great, that the former was sooner freed from the general mass than the latter, and formed a kind of muddy impure atmosphere, surrounding the newly formed globe. Water, being next in levity, succeeded the air, and universally encompassed the earth in one vast ocean. In process of time these elements became perfectly pure and fit for animal life.

106
How the
separation
of its com-
ponent
parts took
place.

4. “The component parts of the chaos being thus progressively separated and formed into select bodies, the following consequences necessarily ensued; namely, as the sun and moon were coeval with the chaos, the solids could not uniformly subside from every part of the surface, and become equally covered by water; for as the separation of the solids and fluids increased, so, in like manner, the tides increased, and removed the former from place to place without any order or regularity. Hence the sea became unequally deep; and these inequalities daily increasing, in process of time dry land appeared, and divided the waters which had

107
Islands
formed by
the attrac-
tion of the
sun and
moon.

hitherto.

Earth. hitherto prevailed universally over the earth. The primitive islands being thus formed, in process of time became firm and dry, and fit for the reception of the animal and vegetable kingdoms.

108
Several days must have elapsed before the sun became visible.

109
Order in which terrestrial bodies were created.

110
Marine animals first formed.

111
Have been buried in the earth at successive periods of time.

112
Mountains and continents formed by subterraneous fire.

113
Theories of Burnet, &c. insufficient.

114
Powers of attraction and repulsion insufficient.

5. "Such appears to have been the natural order and progression of these things; consequently, as the sun was coeval with the earth, several days and nights must have preceded the sun's first appearance in the heavens, or its becoming visible on the fourth day, according to the scripture account.

6. "The atmosphere, sea, and land, being thus formed for the reception of the animal and vegetable kingdoms in successive periods of time, we have now to consider the order in which they were severally created. First, since it appears that the ocean became perfectly pure and fit for animal life before the primitive islands were formed, therefore we have endeavoured to prove from a series of undeniable facts (A), that marine animals were first formed; and being extremely prolific, they increased and multiplied so exceedingly as to replenish the sea from pole to pole. The ocean being thus stocked with inhabitants prior to the formation of the primitive islands, many of them became enveloped and buried in the mud by the continual action of the tides; particularly all the species of shell-fish, which are least able to defend themselves from such interments. Therefore, since the remains of marine animals are imbedded at various depths in the earth, from one to that of several thousand feet, and this in all parts of the world hitherto explored, they bear sufficient testimony, that these marine bodies were thus entombed at successive periods of time; and likewise that they were created prior to the primitive islands, and consequently prior to any terrestrial animals. It may be needless further to observe, that these beds of marine shells plainly evince, that they were generated, lived, and died in the very beds wherein they are found, and were not brought from distant regions by a flood or floods of water, as some people have supposed; consequently such beds were originally the bottom of the ocean.

7. With regard to the mountains, and indeed the continents also, Mr Whitehurst is of opinion, that they are the effects of subterraneous fire. His sentiments on this subject, however, are something singular; for he tells us, that "mountains and continents were not primary productions of nature, but of a very distant period of time from the creation of the world, when the strata had acquired their greatest degree of firmness and cohesion, and the testaceous matter had assumed a stony hardness."

Thus we have given a very particular account of all the theories of any note concerning the formation of the earth which have yet made their appearance. The deficiency of those of Burnet, Woodward, Whiston, and Buffon, must be exceedingly obvious even to the most superficial reader. They all assume only the powers of attraction and repulsion as agents; without considering that these two powers, or indeed any other two with which we are acquainted, could only have composed matters nearly similar to each other. If the original particles of matter are homogeneous, and en-

dowed with similar powers, all the matter we see ought to be homogeneous also. But this is far from being the case. Some parts of it we see are exceedingly hard, others proportionably soft. The parts of some bodies attract each other violently; those of others have hardly any attraction for each other, but are separable by the smallest force. And though it should be granted that the powers of attraction and repulsion were originally different in different parts of matter, we have still to explain by what means the similar parts of matter found out each other in such a chaos as the earth originally was. This seems an insuperable difficulty in the systems of Drs Burnet and Woodward; and is equally, though less conspicuously so, in those of Whiston and Buffon.

Mr Whiston's system has another and very remarkable defect. He supposes the earth to have been originally a comet, and at a certain time to have become a planet: but he forgets to tell us by what means this comet was originally formed, or what kind of bodies the comets are. Yet certainly this theory of the comet was as necessary to his system as the theory of the earth itself: for all the substances now existing on the earth must originally have existed in the comet; and if the natural powers were known which made a distinction between one substance and another in the comet, we would also know those which distinguished terrestrial substances from one another. But though even this great deficiency should be overlooked, the supposition of a chaos or original confusion of any kind involves us in the greatest difficulties. If the whole surface of the earth consisted of a chaos of melted matter, we cannot reasonably think it would have appeared otherwise when cool than the lavas of burning mountains do just now; and this is a consequence of his system which Mr Whiston seems to have entirely overlooked.

Mr Buffon's theory is liable to the same difficulties with the rest. He places his chaos in the sun; and therefore ought to have given a theory of the sun before he gave one of the earth. It ought also to have been shown for what purpose the sun was created when he had nothing to shine upon, or what probability there is that comets existed when there were no planets. His account of the formation of the planets by the stroke of a comet, is just within the verge of possibility; but his account of the formation of mountains by the motion of the winds and tides, is certainly inconsistent with the common principles of mechanics. Though it should be granted, that water can dissolve every terrestrial substance when vitrified by a heat 10,000 times greater than our hottest furnaces, as the sun must necessarily be; and though the water should let fall this matter as a sediment in what quantities and forms we think proper to imagine; it is impossible any of it could be thrown two or three miles above the surface of the water, in order to form those high mountains which are to be met with in different parts of the world. It is indeed very plain, that though by the motion of the waters their sediment might be collected in great heaps, it could never reach higher than their surface. The mountain,

Earth.

115
Deficiency of Mr Whiston's theory;

116
Of Mr Buffon's.

(A) These proofs are afterwards considered, as here our author seems to be of the same opinion with Dr Hutton.

Earth. mountain, once formed, must then be for ever covered with water; for the sediment would take up precisely the same bulk when a mountain that it did when in a state of dissolution, and the water could never retire from it as he supposes. If the waters retired into vast subterraneous caverns, according to another of Mr Buffon's suppositions, they must have remained for ever in these caverns, from whence they could not have returned to effect those wonderful changes he ascribes to them. But what in the strongest manner shows the fallacy of Mr Buffon's hypothesis, is the analogy he draws between mountains on dry land and islands in the sea. The islands, he says, are only the tops of great mountains in the ocean. If, therefore, the ocean had for a series of many ages covered the present habitable part of the world, as our author supposes, we should undoubtedly find many mountains upon the dry land, the tops of which had formerly been islands. But no such thing is to be found. There is not on earth a mountain with a top broad and flat like the island of Great Britain or Ireland, or even like islands of much less consideration.

These, and many other objections that will naturally occur to an attentive reader, show the extreme difficulties under which the hypothesis of Mr Buffon labours, as well as others. These difficulties arise, in the first place, from their assuming too few natural powers. Though it is certain that the powers of attraction and repulsion exist in nature, it is no less certain that there are many others. One very remarkable power entirely different from those of attraction and repulsion, may be called the power of *assimilation* or *transmutation*. By this, each animal, and each plant, changes the nutritious particles thrown into its stomach, or which it meets with in the earth, into a substance of its own peculiar kind. Thus, a stalk of wheat, by means of its roots, always assimilates the nutritious particles of the ground into that particular grain we call wheat, and no other. This power naturalists have not been able to explain on the principles of attraction and repulsion, or any others with which we are acquainted; and therefore it may justly be called one of the primary laws of this earth at least, whether we understand the manner in which it operates or not.—Another power which seems to be diffused throughout this terraqueous globe, and common to all substances, water alone excepted, is that of multiplying themselves, or producing others of the same species. With regard to plants and animals, this is exceedingly evident; but may be disputed in the case of minerals. It is certain, however, that mines which have been exhausted, will in time be again replenished with ore; that spars and crystals, if broken or cut while their connection with the earth remains, will protrude a substance similar to the rest, as certainly as the wounded body of an animal will protrude flesh of a kind similar to what was taken away. The earth itself is capable of this multiplication. We see how it hath a tendency to ascend, and cover stones, &c. which lie a long time on its surface; and thus does this element, seemingly the most sluggish of all others, swallow up every thing that lies for some time undisturbed upon it. Hence we now meet with many monuments of antiquity below ground, which formerly were undoubtedly above it. Yet we have no right from thence to conclude, that the height of the

dry land above the water was greater at that time than what it is now. This multiplication of earth is chiefly owing to vegetation; which continually produces a new crust on the top, and thus tends to bury all such matters as rest upon the surface. This crust, however, does not produce a continual increase in the height of the dry land; for whatever quantity the vegetables add to the surface, they take from the under parts by the suction of their roots. Thus the ground becomes more porous, and the weight of ancient buildings, stones, &c. gradually forcing them downwards, they are at last buried under ground to a considerable depth.—Hence it is easy to account for the sinking of the marine bodies that are to be found at different depths in the earth, even supposing them to have been left on its surface by the deluge. M. Buffon's objection, drawn from the great quantities of them, seems but very weak: for it is certain, that marine animals, both of the crustaceous and other kinds, are found in the sea at this day in amazing quantities; and there is no bed of shells so large, that we can reasonably think it impossible for all the animals to have existed in it at once.

With regard to the strata, it seems undeniable that they may be produced from natural causes. Clay will sometimes be consolidated into stone; flint, marble, and limestone, are all found to grow naturally in the earth; so that we cannot draw any conclusion from the order in which we now find them. Though we find a bed of shells, then, in the heart of a solid rock, this makes no difficulty in the theory of the earth; since we know that the rock hath by some natural cause been consolidated around them. In fact, this is not so wonderful, as what is related by Mr Price in his Treatise of Minerals, Mines, &c. viz. That at the town of Redruth in Cornwall, "some labourers being put to clear and level the street for a pavement, they found a piece of hard stone in the ground, with abundance of common small pins of brass interspersed in and throughout the stone, in such manner and form, that all those who saw it afterwards were convinced it was not done artificially, but that the stone was formed and produced by petrification, subsequent to the time the pins were dropped into the ground. Doctor Plot, in his Natural History of Staffordshire, says, that near Newcastle under Lyne, there was found a stone with a man's skull, teeth and all, inclosed in it."—From these and other facts in some measure similar, this author concludes, that every earth or clay, in some places, may be converted into stone in process of time, at such a depth where it is undisturbed by being never lacerated nor molested, and also where it abounds with an uncommon quantity of juices of a lapidescent quality: but this property being extenuated or destroyed, the earthy stones may not improbably again return to their primitive clay. Thus we see some sorts of stone, when dug out of the ground and exposed to the air for a considerable time, do moulder again into earth, at least in appearance; while others, of an earth-like quality, are indurated, and become more compact and durable by lying above ground."

The theory laid down by Dr Hutton is of a different nature from the rest; and as it has been supposed directly to militate against revelation, merits a very particular consideration. The expression, however, with

Earth. which he concludes his dissertation, that "we can find no vestige of a beginning—no prospect of an end," might be supposed to relate only to the deficiency of our understandings or mode of inquiry, had he throughout the whole course of his work given a single hint of any *materials* from which the world was originally formed. In this he differs most essentially from the other theorists whom we have mentioned; for all of them suppose a chaos to have been originally created, from whence all the variety of substances we see at present have been formed. But as the Doctor makes no mention of any thing prior to a world nearly similar to what we see just now, we must necessarily conclude that its eternity is a part of his creed. Now, that the world has not been eternal, may be proved from what he himself allows. Wherever we perceive a succession, we know that there must of necessity have been a beginning: but, according to our author, there has been a succession of worlds, by a kind of uncouth generation, similar to what would happen to the human race if a man was to descend immediately from his grandmother. Proceeding in this way, therefore, we must at last arrive at one great-grandmother of earths, from whence all the rest were descended; and of this one a theory was no less necessary than of any of her successors. This theory would have been the more difficult, as his great element *cockle-shells* and *oysters* would then have been absent, and the materials from whence they were afterwards to be produced must have been sought for.

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Arguments
against the
eternity of
the world

122
From the
succession
of worlds
supposed by
Dr Hutton.

123
A superna-
tural power
necessary in
the forma-
tion of the
world.

124
Shown
from the
production
of animals
and vegeta-
bles.

125
Quantity of
shells found
on earth
too small
on the Doc-
tor's prin-
ciples.

* See n° 90.
126
Amazing
increase of
shell-fish.

Another argument, which evidently shows not only that the world is not eternal, but that some other power besides its own interfered with it originally, may be taken from the existence of animals and vegetables; both of which our author allows to have had a place throughout all his worlds. We see at present, that animals proceed from animals, and vegetables from vegetables; but the time must have been, when an animal was produced without a parent, and a vegetable without a seed. At this time the world must have been influenced by a power different from any it possesses at present; for no such power is now to be found in any part of the globe.

Lastly, the quantity of shells, great as it is, can by no means be reconciled with an eternal succession of worlds, or even with three; for, according to him, we must have *three* in order to have *two* habitable ones; viz. one lying at the bottom of the sea, another wearing away, and another beginning to emerge. Now he informs us, that only a fourth part of our land is composed of calcareous matter derived from marine animals*. But if one of the worlds has continued for a time *indefinite*, and consequently another lain at the bottom of the sea for an equal length of time, it must, instead of having a fourth part of its soil composed of calcareous matter at the time of its emergence, have been entirely composed of it, at least if we can credit what is said concerning the prolific nature of these animals. Mr Whitehurst informs us, that "it is not uncommon to take away a bed of shell-fish several fathoms in thickness; and though the places where they are fished for appear to be entirely exhausted, yet in the ensuing year there shall be as many found in all these places as before." Such an amazing increase must, in a time *indefinite*, especially if repeated for an indefinite number of times, have reduced the whole

terraqueous globe to an heap of cockle-shells or other substances of that kind.

Our author is equally unfortunate in the very first step of his argument, where he says that the soil is only "the materials collected from the destruction of the solid land." He owns that all his earths produced vegetables; but these must have had a soil whereon to grow before the first world had time to be destroyed. We are therefore here in the same dilemma with regard to the soil that we were before with regard to the vegetables; and as we are obliged to own the interference of a Superior power to produce the first vegetable, so must we also have recourse to the same power for the production of the soil on which it grew. All these considerations ought to have led the Doctor to a conclusion very different from that which he has drawn, and to have showed him that the *beginning* of the world was occasioned by a power which cannot possibly be investigated, because it lies without the bounds of Nature itself, and far beyond the reach of our faculties.

This objection indeed militates invincibly against all theories of the earth which seek to derive its original from natural causes. The powers of attraction and repulsion we have already shown to be insufficient; and though we should add to them those of fire and water, with all the train of solvents and precipitants which chemistry can afford, the deficiency will still be as great. It is true, that by means of chemistry we can imitate many of the natural operations, provided we have the proper materials: But this is the capital defect in all our theories of the earth. Whence came vast quantities of argillaceous earth into one place, of siliceous earth into another, of the materials for iron, silver, gold, &c. into the places where they are now found? With Dr Hutton indeed the whole seems to be composed of two materials, viz. calcareous earth and flint. But before he could justify this assertion, he ought to have produced from these two materials, at least a great number of the different substances with which the earth is replenished. But instead of this, he has recourse to natural productions, formed, as he says, by means which, in the hands of the best chemists, will prove insufficient to produce any thing like them.

In his account of the origin of calcareous matter, he tells us, it is to be derived entirely from the shells of marine animals; but he forgets to inform us whence these animals got their shells. There must have been some source of calcareous matter from which the *first* oyster (for we have already seen that they could not have existed from eternity) derived its shell, and that independent of any other marine animal. Now we see at this day an abundant source from whence the shells of all marine animals may be derived, viz. the waters of the ocean, which contain a great quantity of calcareous matter. If we inquire whence these waters have it, we may say they take it up from the earth, part with it again in the form of shells, corals, &c. redissolve it, and so on. But if we will still inquire farther whence the earth itself had it, we must once more have recourse to that unsearchable and supernatural power to which we ascribed the origin of animals, vegetables, and the soil whereon they grow.

It is the foundation of Dr Hutton's theory, and indeed

Earth.

127
A superna-
tural power
must have
taken place
in the ori-
ginal for-
mation of
vegetable
soil.

128
Origin of
the earth
cannot be
accounted
for from
natural
causes.

129
Too much
attributed
to calcare-
ous earth
and flint by
Dr Hutton.

130
Calcareous
matter pre-
ved to exist
independ-
ent of ma-
rine ani-
mals.

131
Earth proved not to have remained long at the bottom of the sea.

deed seems now to be a favourite doctrine of most theorists, that the earth we inhabit has once been at the bottom of the sea; and it is thought to be a sufficient proof of this, that such vast quantities of marine shells are to be met with on dry land. Mr Whitehurst, after giving a long account of these shells, infers, among other things, that the "beds of fossil shells, which consist of one species only, and are not natives of the climate where found, but of very distant regions of the earth, evidently show that they were generated, and have lived and died in the very beds where found; and could not have been removed from their native climates by a flood or floods of water, with so much order as to form beds consisting only of one select species; and therefore all such beds must have been originally the bottom of the ocean."

132
False mode of reasoning adopted by many theorists.

On this mode of reasoning, however, we must observe, that no hypothesis can have a worse foundation than when it is built confessedly on our own ignorance. We know not, for instance, how a bed of fossil shells came into a certain place; therefore the whole world has been at the bottom of the sea for many thousand years, the climates have changed, or it has been eternal! Thus to unhinge the settled laws of nature for such trivial purposes, is certainly the greatest contradiction to true reasoning that can be imagined. But it is not only from a negative argument of this kind that we may refute this hypothesis; there is a much stronger one drawn from the marine productions themselves. It is certain, that there are substances very different from shells of any kind, which grow up from the bottom of the ocean, and in time *indefinite* ascend all the way to the surface, and there form islands. These are the coral rocks so common and so dangerous in the South Sea, and of which many of the islands there are formed. Now, how comes it to pass, that among all the marine monuments to be found on land we find no coral rocks growing there? The answer to this is obvious. The coral rocks require a vast length of time for their production, and are strongly fixed to the place where they grow; they cannot therefore be removed over land by any sudden flood or inundation, not even by a general deluge. Though it appears therefore, from the shells and other marine moveables, that what is now dry land has once been at the bottom of the sea, yet it is equally evident from the deficiency of these rocks, that it has not remained so for any length of time; and therefore, though we should by no means be able to explain all the appearances of fossil shells, we are not to admit a supposition which, from the circumstance just mentioned, cannot possibly be true.

134
Why every appearance of fossil shells cannot be explained.

135
Of the effects which the deluge certainly produced.

With regard to these shells, however, we must remark, that it is in vain to attempt the explanation of every appearance; nor can any such thing be reasonably desired, even though we should acknowledge the deluge to be the universal cause. We know not, nor can we have any conception of, what might be accomplished by the mere mechanical motion of the waters in this case. Every one who has had an opportunity of seeing the effects of a violent land-flood, will be ready to own that it has performed things which *a priori* he would not have thought it could have done. But how infinitely must these effects be exceeded by one vast deluge, in which not only the dry land was soft-

N^o 107.

ed by an incessant rain of six weeks, but the sea rose on all sides, and poured in upon it with all the moveable contents which the waters carried along with them?

That great numbers of shells already formed would be brought along with the waters of the ocean, is an assertion which can scarce be denied; and we shall be inclined to look upon this number as exceedingly great, if we consider the way in which it is most probable that the deluge came on. This was by the issuing out of waters* from every pore of the earth and bottom of the ocean, as well as by their descent from the clouds. In consequence of the former action, all the light bodies at the bottom of the sea must have been turned topsy turvy, and carried up no one can tell how far; at the same time that by the progressive motion of the waters they were carried to an unknown length over the land, and there deposited when the motion ceased.

This circumstance of itself will account for the appearance of vast numbers of shells and other marine productions on land; but there is another which must be taken along with it, and will undoubtedly add greatly to its force. The unfathomable depths of the ocean are not the proper habitations of fish; and they are only found on shoals, or near the sea-coasts. At the time of the deluge, therefore, great numbers of the marine animals must have exchanged their ancient habitations for those where the water was more shallow; and of consequence would have abounded on the tops of mountains and other elevated places. Whether those animals whose exuviae are most plentifully met with on land have any locomotive power when full-grown, is uncertain; but whether they have or not, they are certainly of such minute sizes when young, that they may be floated to any distance by water. Thus therefore any kind of shell-fish may have reached any place in the globe; and Mr Whitehurst himself owns, that they can arrive to their full maturity in less than a year, as the beds which have been exhausted one year are found to be replenished the next. Now the flood, according to the Scripture account, continued long enough to allow time for their increase from spawn to their full size. It arrived at its full height in 40 days; and continued stationary for five months. It then began to decrease; but so gradually, that it was not till the first day of the tenth month that the tops of the mountains began to appear above the surface of the water; and it was not till towards the end of the eleventh that the tops of trees began to emerge. Here then we have time for beds of shell-fish to grow, live, and afterwards be left by the water; which in their mature state they could not follow, and thus to die in the places where they were generated.

Thus far we may safely argue with regard to the existence of large beds of shells on the surface of the earth: and it has already been shown how the earth would naturally cover and swallow them up to a considerable depth. But to account for the great depths at which we find them sometimes buried, several other things must be taken into consideration. One is, that the earth, by the continual rains at the time of the deluge, as well as by the issuing of the waters every where through its substance, must have been exceedingly soft and easily penetrated. The helpless animals, there-

Earth.

136

Vast numbers of shells must have been brought along with it.

See De la Luge.

137

The fish would leave their former abodes to dwell over land.

138

The continuance of the flood allowed time for the shell-fish to breed on land.

139

Numbers of shells would be sunk deep into the earth by the pressure of the waters.

Earth. therefore, brought along with the ocean at its first irruption over land, would have been deep buried in the mud: and when we take into our account the pressure of a column of water four miles deep, it is impossible to say what effects this cause might have produced. They might, besides, have been accumulated in clefts of rocks, in hollows, valleys, and caves; and have been there consolidated by petrification and the growth of calcareous matter over them. And that something similar to this actually happens, we are very certain: for Mr Whitehurst informs us, that "the springs of Matlock-bath in Derbyshire, though extremely pellucid and friendly to the human constitution, are nevertheless plentifully saturated with calcareous matter, which readily adheres to vegetables and other substances immersed in their streams; and thus, by a constant accretion, large masses of stone are gradually formed. The banks on which the bath-houses stand, and likewise the buildings themselves, are mostly composed of such materials."—Now, had these waters directed their course over a bed of shells, through a burying-place, or over a field of battle, it is evident that they would have inclosed a great number of shells, human and horse bones, heads of lances, swords, or even the more modern weapons of guns and pistols; which, to a curious naturalist, might have furnished an argument for the antiquity of these latter weapons. If therefore we see that bodies at this day may be so easily imbedded in stone, why should we pretend to set bounds to the petrifications which may have happened in the course of more than 4000 years? a period far beyond the reach of our most ancient histories.

substance of the stone; and we have likewise several instances related by authors of the bones of terrestrial animals, and also of wood, having been found enveloped in strata of stone. A complete human skeleton, with British beads, chains, iron-rings, brass bits of bridles, were dug up in a stone-quarry near the Earl of Widdrington's seat at Blankney in Lincolnshire.—Human bones and armour, with Roman coin, fibulae, &c. were found in a stone-pit in the park at Hustanton in Norfolk, supposed to have been buried after a battle.—In the mountains of Canne, half a league from Meaftrick, were found the remains of a crocodile well preserved in a stratum of sand-stone.—The remains of a crocodile were also found in a stratum of stone at Blenheim.—The beds of argillaceous stone, &c. incumbent on coal, also contain a great variety of figured fossils representing different parts of the vegetable creation."

Earth.

From all these examples it is plain, that the lapidescent power which the earth possesses is capable of incrusting bodies with stone to an unknown thickness. In whatever situation therefore we find those fossil bodies, we have no reason to say that the deluge is not ultimately the cause of their being there; because its power in overspreading the earth with them, in burying them in it, or forcing them into clefts and caverns, is altogether unknown: and before it is denied that the deluge could be the cause of such appearances, it is necessary to show all that it really *could* do, which is evidently impossible; so that here our speculations must ultimately rest.

142

The deluge may be supposed the general cause of fossil animal substances.

We shall only add one other fact which must certainly have taken place at the deluge. At that time the world is generally thought to have been very full of inhabitants. These, as well as all the inferior animals, would naturally fly from the approaching danger. This would assemble them in great numbers in such places as appeared to afford security; and here they would all perish together. This will account for the vast heaps of bones found in certain parts of the world, as in the rock of Gibraltar, Dalmatia, &c. and the natural petrificative power of the earth may account for their consolidation. The slaughters which mankind have made of one another may indeed account for many of these appearances. When we read in history of 40,000, 50,000, or 100,000 men being killed in a battle, we never think of the space their bones would occupy when thrown into a heap; nevertheless, we are assured that the bulk of these remains must be very great. Tamerlane, with an army of 800,000 men, filled up the harbour of Smyrna by causing each of his soldiers throw one stone into it; and when Marius defeated the Cimbri, the bones of the slain were so numerous, that they were used for a long time as fences for vineyards. Had these been collected into one heap, and afterwards consolidated by petrificative matter, they would undoubtedly have occupied a very considerable space. What then must have been the case, when every man, nay every other terrestrial creature, died at once? Taking all these things into consideration, it must surprise us that the collections of fossil bones are not more numerous than we find them.

143

Of fossil human bones.

140
General recapitulation of facts.

It is not meant, by what we have just now said, to explain all the appearances of fossil shells or bones from the deluge as a general cause. This cannot be done unless we knew all the circumstances. The following facts, however, may be looked upon as authenticated. 1. That when the waters overwhelmed the land, great numbers of marine animals were carried along with it. 2. That during its continuance most of those which have any locomotive power would choose rather to dwell over land than in places which had formerly been their residence. 3. That while the waters remained on the earth, all kinds of marine animals would breed over land in their natural way; and such as could not follow the waters in their retreat, would be left to die on dry land, which must have been the case particularly with shell-fish. 4. These impotent animals, which have little or no power of locomotion, would by the pressure of a column of water four miles high be buried to depths unknown. 5. After the retreat of the waters, those which had been lodged in hollows or clefts, or perhaps diffused through the substance of many soft strata, might by some petrifying quality in the stratum be so consolidated along with it as afterwards to form one entire rock. This is evident, not only from the example of the Matlock-springs, but more so from that of the pins found in the stone at Red-Ruth in Cornwall, from the petrified skull mentioned by Dr Plott, and many others; of which we shall mention the following from Mr Whitehurst.—"The strata of limestone in Derbyshire, and in many other parts of England, abound with the exuviae of marine animals, or the impressions of them in the solid

141
Examples of bodies inclosed by stone.

Earth.
144
Dr Hut-
ton's ac-
count of the
formation
of the strata
considered.

there is the strongest reason for denying that the land we inhabit has been for a length of time at the bottom of the sea. Dismissing therefore this part of Dr Hutton and Mr Whitehurst's theories, we shall now proceed to consider that of the former, where he investigates the formation of the strata. These, he says, could not be formed by aqueous solution. That they could not be so originally, we readily grant; but that they have preserved themselves from decay, transformed themselves into one another, and repaired their waste by this means, is absolutely certain. The Doctor indeed gives up his own argument; for he tells us, that "if flint can be produced by crystallization from water or any aqueous solution, then may his assertions concerning the consolidation of the strata be denied." But Mr Bergman assures us, that he actually did produce flint by allowing a quantity of fluor acid to stand for two years on some powdered quartz; and this is more than any chemist can pretend to do by the violent heat of fusion, to which Dr Hutton has recourse on all occasions. We do not pretend, however, to say, that the different strata of earth have been formed originally by aqueous solution. For this we must have recourse to the power already mentioned, and for want of which neither Dr Hutton's theory nor any other can support itself. But though the strata were originally formed by Divine power, they are certainly preserved, repaired, and changed by natural causes; of which aqueous solution is a principal, though not the only one.

146
Wood may
be penetra-
ted by flint
in a state of
solution.

The said experiment of Mr Bergman's entirely overthrows the Doctor's objection (n^o 39.) relating to the penetration of wood by siliceous or flinty matter. It shows, that the matter in question may be dissolved, and in no very long time deposited in its proper form; so that had Mr Bergman inclosed a bit of wood in his bottle which produced the flint, there is no reason to doubt that it would have been so penetrated by the siliceous matter as to be completely *flintified* (to use Dr Hutton's word) by the end of the two years.

147
Flints may
thus grow
in the heart
of chalk.

The *impossibility* which our author talks of, of flinty substances being found insulated in the midst of beds of chalk, is likewise thus removed. But if we view his own account of the petrification of wood by the action of melted flint, what mortal in his senses can give him credit? It exceeds the power of a glass-house furnace to melt flint by itself: how is it possible, then, that the combustible substance of wood should bear to be filled with this dreadful fluid without being burnt? The operation being performed under water, will not answer the purpose: for wood may be reduced to charcoal, by the heat of a burning-glass, under water; and a red hot iron, thrown into a wooden vessel full of water, will burn a hole in the bottom. Dr Black, who mentions this circumstance in his Lectures, very justly observes, that the steam which is produced keeps off the water until the iron has produced its effect. Must not the same effect take place at the bottom of the sea, even granting, what Dr Hutton never can prove, that flint, by any degree of heat whatever, can be reduced to such a state of tenuity as to be capable of penetrating wood like an anatomical injection? Here indeed he may tell us, as on another occasion, that

† See n^o 46. the compression of the water is *insuperable* †. But if this be the case, how comes it to pass, that not only

this insuperable compression, but an additional one (no less than the vast loads of earth which compose the continents of Europe, Asia, Africa, and America), has actually been overcome, and these immense tracts thrown up from the bottom of the ocean, by the force of fire which could not consume a piece of wood?

Earth.
149
Contradiction in the
Doctor's
hypothesis.

To suppose that, by any compression whatever, the element of fire, when applied to a combustible body, should be prevented from destroying its texture, is certainly without the least foundation; and yet upon this and similar suppositions proceeds the whole of the Doctor's theory. He differs from those who maintain the volcanic theory, in supposing that fire may work underground in such a manner as to perform none of its common effects, or indeed none but such as are agreeable to his own hypothesis. Thus fire, working at the bottom of the sea, or at an unknown depth under it, shall not burn wood; it shall not extricate the fixed air from calcareous matter, but melt it sometimes into one substance and sometimes into another; it shall not dissipate the most volatile substance, nor in short perform any effect which we ever saw performed by fire: and all this, it seems, is demonstrable by the mere inspection of fragments of stones in a closet, without paying the least attention to the operations of nature abroad.

Though it must be very evident that a theory built on such extravagant principles cannot support itself, we must still take notice of the proofs he adduces from the mineral crystallizations, &c. On this subject it may be observed, that there are various ways by which substances can be crystallized or assume regular figures.

151
His proofs
from mine-
ral crystalli-
zation con-
sidered.

1. The most common is by solution in a large quantity of water, from which the bodies are deposited by cooling, and form distinct and regular crystals. 2. By solution in no greater quantity of boiling water than will keep them suspended; after which they are formed into large masses, as is the case with alum. 3. By slow evaporation, as is the case with vitriolated tartar and some other salts. 4. By efflorescence, when a saline fluid is mixed with a quantity of earthy matter, and kept moist for some time. Of this we often have an example in moist cellars, or other damp places, where we shall see part of the walls covered with a fine, downy, saline matter. In salt-butter also we shall frequently see the same appearance; where the salt shoots into small spiculæ, though in the common way it crystallizes in cubes. 5. By sublimation, as in the case of flowers of benzoin, of corrosive mercury, cinnabar, sal ammoniac, orpiment, &c. &c. 6. By the meeting of two substances in an aerial form, as alkaline and fixed air. By the attraction of fixed air from the atmosphere or otherwise, as is the case with alkaline salts when long exposed to the common air, or for a shorter time to a stream of pure fixed air. 7. By precipitation, as in the arbor Dianæ and other metallic vegetations. 8. By means of acids. Thus the residuum of Glauber's spirit of nitre, if the distillation has been performed with an excess of acid, will shoot into beautiful ramifications like branches of trees. 9. By fusion, as in regulus of antimony and other metals, sulphur, &c.

Now of all these different ways by which crystallization may be effected, Dr Hutton has chosen only the last; and this he obstinately carries through the whole system

Earth. system of nature, whether reasonable or not. His argument against any other mode is chiefly built upon the insolubility of certain substances; but this argument has failed in one very remarkable instance, *viz.* that of flint, which has been produced by aqueous solution. Another instance he brings, n° 42, of "marmor metallicum, consisting of terra ponderosa saturated with vitriolic acid, a substance insoluble in water." Now though this substance, when once it is formed, may be termed absolutely insoluble; yet the fact is certain, that it may be formed by aqueous solution and crystallization; and we have done so by the following process: Let terra ponderosa be formed into an hepar sulphuris by any of the common methods; dissolve the mass in water; filter the solution, and expose it to the air in a vessel kept in a gentle warmth: the phlogiston of the sulphur will gradually fly off; the acid attach itself to the earth; and in a day or two a great quantity of fine crystalline spiculæ will be formed, which are a true marmor metallicum.

153 Dr Hutton's argument from the insolubility of certain substances insufficient.

154 Marmor metallicum formed by crystallization.

155 How bodies naturally insoluble may be formed by aqueous solution.

156 Of the formation of selenite.

157 Fine crystals formed by continued accretion.

158 Fluor spar may be formed by aqueous solution.

159 And likewise calcareous spar.

Thus we learn how many bodies, naturally insoluble, may yet be formed by aqueous solution by reason of the solubility of their component parts. Sulphur is soluble by calcareous earth and by terra ponderosa, and makes these substances soluble in much greater quantity than they naturally are. By the decomposition of the solution of terra ponderosa, marmor metallicum is produced; and by decomposing the other, selenite or alabaster. This last substance Dr Hutton has not thought proper to mention, though huge masses of rock are composed of it; and it is incapable of fusion without being destroyed. Its regular figures, however, afford us a fine example of that species of crystallization which proceeds from precipitation or accretion. The selenite is a substance very little soluble in water; yet by the perpetual deposition of small quantities, we see that beautiful and regular crystals are formed: and hence we learn another important fact, *viz.* that in order to form these crystals, it is not always necessary that the whole of the substance should be dissolved in water at once, though this is the case with our artificial crystallizations. The largest and most transparent crystals, and even the most insoluble in water, may have been formed by the continual accretion of crystalline matter from an aqueous solution: and thus they may appear in any cavity whatever; for as there is no mineral substance impermeable to water, it evidently follows that no cavities can be impermeable to it.

Among his other insoluble substances Dr Hutton mentions fluor and calcareous spar. But as we know that one of the component parts of fluor is calcareous earth, naturally soluble in water, it is only necessary to suppose a calcareous water like that of Matlock to meet with fluor acid; when as great quantities of fluor would be produced as there are at present of calcareous stone.

The same thing may be said of calcareous spar.—We know that fixed air will precipitate calcareous earth from water, or redissolve it after it has been precipitated, according to its quantity. The formation of spars, therefore, from calcareous matter dissolved in water and fixed air, may easily be understood; and we know that there is no water which does not contain some quantity of calcareous earth. Of fixed air there

is always great plenty in the bowels of the earth; and according to the quantity uniting itself with the dissolved calcareous earth, either chalky concretions or crystalline bodies will be produced. If fire were applied to this calcareous matter in order to fuse it, an emission of the fixed air would be the certain consequence; and without this we have not the least evidence that calcareous earth ever did or could undergo any fusion by heat.

With regard to the mineralization of metals by sulphur, as in the case of pyrites, we cannot pretend to explain them particularly; though it was certainly incumbent on the Doctor to have formed these bodies, or to have produced something like them, by fusion, before he determined that they were formed originally in this way. It is easy, however, to see how the calx of a metal may meet with sulphur in the earth. We know that sulphur is soluble by alkali, by terra ponderosa, or by calcareous earth. By exposing this solution to fixed air, part of the sulphur is separated, and may unite with the metallic earth, or any other thing with which it has an affinity. The crystallizations of sulphur artificially united with metals have not indeed been examined; but before we affirm that a metal is mineralized by fusion with sulphur, we ought to perform something like it artificially, which never has been done.

As to the invincible argument n° 43, where our author triumphantly challenges his adversaries to show how petro-felix, pyrites, and cinnabar, can be dissolved in water; it may be replied, that Mr Bergman has decided the matter against him with regard to the first, by his remarkable experiment of making flint: the second is as yet undecided; for no chemist has been able to make pyrites either by solution or fusion. The third is likewise decided against our theorist; for Dr Lewis has shown that cinnabar may be prepared by solution of sulphur as well as in the dry way by sublimation. We have only to suppose therefore that a calcareous solution of sulphur pervaded this mineral, while a number of particles of quicksilver were dispersed through it; in which case the latter, attracting the sulphureous particles, would form the cinnabar in question.

Our author's argument (n° 44) from metals being found in their perfect state, is very inconclusive. The mass of native iron he speaks of, is by many thought to be factitious; and as to the small bits of other metals sometimes found native, they rather make against him than otherwise: for had they been melted, all the rest of the matters around them must have been melted also; in which case the superior weight of the metals would have carried them to the bottom of the melted mass, there to unite as in a common furnace.

His arguments concerning bituminous bodies are equally unfortunate with the rest. That coal is derived from wood has been the opinion of very learned men, particularly Dr Black. The argument, however, is only this, that sometimes we see coals with woody fibres, plainly indicating their vegetable original. But this would hold equally with regard to stones; for we often see wood penetrated with stony matter, while its fibrous texture still remains. In this case therefore we might as well suppose that stones are derived from wood as that coals are so. A decisive proof that coals are not produced by fusion, is,

K k 2

that

Earth.

160
Of the formation of pyrites by aqueous solution.

161
Formation of cinnabar in the moist way.

162
Of metals found native.

163
Coals supposed to be formed from vegetables.

Earth.
164
Certainly
not formed
by fusion.

that a living toad has been taken out of the heart of a solid piece of coal. This is similar to the entombment of the fishes called *pholades* in the heart of stones; and as, in the latter case, we believe that the stone has concreted round the fish, so we have the same reason to believe, in the former, that the coal had consolidated round the toad. All that we can say therefore is, that coal is formed by a natural, and not very tedious process, unknown to us; but that this process certainly is not fusion. His proof n° 47 is altogether inconclusive; for we have already seen that flinty substances and marmor metallicum may be produced by aqueous solution.

165
Dr Hutton's theory
entirely erroneous.

Thus we have seen, that, contrary to our author's hypothesis, the world has undoubtedly had a beginning; that our dry land has not, for ages, been the bottom of the sea; that we may reasonably suppose the deluge to have been the cause of all or most of the fossil appearances of shells, bones, &c. we meet with; that our author has erred in denying to aqueous solution the effects which experience has shown it capable of producing, and in ascribing to fusion effects which experience doth not warrant; and that his theory, far from having any foundation in chemistry, is directly contradicted by that science. It would be tedious and disagreeable to proceed farther in animadverting on a theory so truly unphilosophical, however elaborate and ostentatious in a display of facts: we shall therefore content ourselves with taking notice of one other objection to his doctrine, of which he himself

166
His method
of accounting
for the
water contained
in siliceous bodies.

has been aware, with the answer he has given. The objection is, That there are sometimes found flinty and crystalline bodies containing water: It seems therefore a contradiction to say that such were produced by fusion. To this the Doctor replies, "It must not be here objected, that there are frequently found siliceous crystals and amethysts containing water; and that it is impossible to confine water even in melted glass. It is true, that here, at the surface of the earth, melted glass cannot, in ordinary circumstances, be made to receive and inclose condensed water; but let us only suppose a sufficient degree of compression in the body of melted glass, and we can easily imagine it to receive and confine water as well as any other substance. But if, even in our operations, water, by means of compression, may be made to endure the heat of red-hot iron without being converted into vapour, what may not the power of nature be able to perform?"

167
Final test
of the truth
of his hypothesis.

On this reply we shall only observe, that the truth of this hypothesis, as well as of all other parts of it, may easily be put to the trial by those who have any of these crystals in their possession. Let one of them be broken, and the water it contains examined. If the crystal has been formed by fusion at the bottom of the sea, as Dr Hutton supposes, it will be salt; if otherwise, fresh. As to his doctrine concerning subterraneous heat and volcanoes, there will be occasion to consider it under the article VOLCANO.

168
No sufficient
proof of extraordinary
changes on
the surface
of the
earth.

We must now take into consideration those remarkable changes which are supposed to have taken place on the globe, in such a manner as entirely to have altered its appearance. These, however, do not appear to have any solid foundation. Changes, no doubt, have happened in particular parts; new islands have

been thrown up from the bottom of the sea by the force of subterraneous fire, and others have been swallowed up. But these appear to be merely the effects of volcanoes, which are common in many parts of the world; and we are not warranted to conclude, because we see a small volcanic island arise, and another swallowed up, that this has been the case with the whole habitable world.—An imperfect theory hath indeed been suggested by Sir William Hamilton, Mr Brydone, and others, concerning the use of volcanoes and subterraneous fires; from whence it might seem probable, though they do not indeed say so in direct terms, that all the dry land was originally thrown up from the bottom of the sea by the force of these fires. Sir William Hamilton, in his letter to Dr Maty, broaches this theory in the following words. "I am myself convinced, that the whole circuit, so far as I have examined, within the boundaries marked in the map (extending at least 50 Italian miles in length, and 30 in breadth where broadest), is wholly and totally the production of subterraneous fires; and that most probably the sea formerly reached the mountains that lie behind Capua and Caserta, and are a continuation of the Apennines. If I may be allowed to compare small things with great, I imagine the subterraneous fires to have worked in this country under the bottom of the sea, as moles in a field, throwing up here and there a hillock; and that the matter thrown out of some of these hillocks formed into settled volcanoes, filling up the space between the one and the other, has composed this part of the continent, and many of the islands adjoining.

"From the observations I have made upon Mount Ætna, Vesuvius, and the neighbourhood, I dare say that, after a careful examination, most mountains that are, or have been, volcanoes, would be found to owe their existence to subterraneous fire; the direct reverse of what I find the commonly received opinion.—Nature, though varied, is certainly in general uniform in her operations; and I cannot conceive, that two such considerable volcanoes as Ætna and Vesuvius, should have been formed otherwise than every other considerable volcano of the known world. I do not wonder that so little progress hath been made in the improvement of natural history, and particularly in that branch of it which regards the theory of the earth: Nature acts slowly; it is difficult to catch her in the fact.

"From repeated observations I have made in the neighbourhood of Vesuvius, I am sure that no virgin soil is to be found there; and that all is composed of different strata of erupted matter, even to a great depth below the level of the sea. In short, I have not any doubt in my own mind but that this volcano took its rise from the bottom of the sea; and as the whole plain between Vesuvius and the mountains behind Caserta, which is the best part of Campagna Felice, is (under its good soil) composed of burnt matter, I imagine the sea to have washed the feet of those mountains, until the subterraneous fires began to operate, at a period certainly of a most remote antiquity.

"The soil of the Campagna Felice is very fertile; I saw the earth opened in many places. The stratum of good soil was in general four or five feet thick; under which was a deep stratum of cinders, pumice, fragments of lava, and such burnt matter as abounds near

Mount.

Earth.
169
Volcanic
theory.

Earth. Mount Vesuvius and all volcanoes. The mountains at the back of Caserta are mostly of a sort of limestone, and very different from those formed by fire; though Signior Van Vitelli, the celebrated architect, has assured me, that in the cutting of the famous aqueduct of Caserta through these mountains, he met with some soils that had evidently been formed by subterraneous fires. The high grounds which extend from Castell-a-Mare to the point of Minerva towards the island of Caprea, and from the promontory that divides the bay of Naples from that of Salerno, are of limestone. The plain of Sorrento, that is bounded by these high grounds, beginning at the village of Vico, and ending at that of Massa, is wholly composed of the same sort of tufa as that about Naples, except that the cinders or pumice-stones intermixed in it are larger than in the Naples tufa. I conceive, then, that there has been an explosion in this spot from the bottom of the sea. This plain, as I have remarked to be the case with all soils produced by subterraneous fire, is extremely fertile; whilst the ground about it, being of another nature, is not so. The island of Caprea does not show any signs of having been formed by subterraneous fire, but is of the same nature as the high grounds last mentioned; from whence it has been probably detached by earthquakes, or the violence of the waves. Rovigliano, an island, or rather a rock, in the bay of Castell-a-Mare, is likewise of limestone, and seems to have belonged to the original mountains in its neighbourhood: in some of these mountains also, there are petrified fish and fossil shells, which I never have found in the mountains which I suppose to have been formed by explosion. Bracini, however, in his account of the eruption of 1613, says, that he found many sorts of sea-shells on Vesuvius after that eruption; and P. Ignatio, in his account of the same eruption, says, that he and his companions picked up many shells likewise at that time upon the mountain: this circumstance would induce one to believe, that the water thrown out of Vesuvius during that formidable eruption came from the sea."

170
Insufficiency of the volcanic theory.

This may serve to show upon what grounds the volcanic theory stands: but though we should admit it in its utmost extent, the theory of the earth can receive but very little assistance from it. Sir W. Hamilton himself does not say that all the mountains have been volcanoes, or that all the soil throughout the different quarters of the world hath been thrown up from the bottom of the sea. If, therefore, there remains but one mountain in the whole world which never was a volcano, we shall be as much diffculted to account for the production of that one, as though there were ever so many; and at any rate our theory will be absolutely useless, because what will account for the origin of that mountain, will also account for the origin of others. If we go a step beyond our author, and say, that there are no mountains whatever that have not been originally volcanoes, but that all the dry land is the production of subterraneous fire, our difficulties are so far from being removed, that they are greatly increased. The lavas and volcanic ashes, though in time they become covered with an exceedingly fertile soil, remain absolutely barren for a great number of years; inasmuch that, by the adopters of the volcanic hypothesis, the

period at which Moses fixes the creation is reckoned by far too late to have given time for covering the many lavas of Italy and Sicily with the depth of earth they just now have upon them. The whole world therefore must have remained for many ages in a state of absolute sterility; and by what means or in what corner of the world vegetation first began, remains to be inquired into.

Without entering further into the theories either of Sir W. Hamilton or any other person, it is easy to see, that all of them are insufficient to solve the difficulties mentioned n^o 11. It is common to account for the spheroidal figure of the earth, from the greater centrifugal force of the equatorial parts than of the polar ones; but this explication can by no means be deemed sufficient. The globe we inhabit is composed of two very different kinds of matter, earth and water. The former has a very considerable power of cohesion, besides the gravitating power; the latter has very little cohesion, and its parts may be separated from each other by whatever will overcome its weight. It follows, therefore, that the solid parts of the earth, resisting, by their cohesion, the centrifugal force more than the water, ought not to dilate so much. The waters of the ocean therefore ought, about the equator, to swell up and overflow the land; and this they ought to do at this present moment as much as at the first creation. That this ought to be the case, is evident from the phenomena of the tides. It is not to be doubted but that the attraction of the moon affects the solid earth as well as the sea; but because of the greater cohesion of the former, it cannot yield as the ocean does, and therefore the waters are raised to some height above it. Mr Whitehurst and others indeed solve this difficulty by supposing the earth to have been originally fluid. But this is arguing in a circle: for if we desire them to prove this original fluidity, they will do it by the spheroidal figure of the earth; and if the cause of the spheroidal figure is required, they refer us to the original fluidity. See *Whitehurst's Inquiry*.—The height to which the waters would have covered the equatorial parts by the centrifugal force, must have been equal to the depression at the poles; which, according to M. Buffon, is about 17 miles; according to other mathematicians, 25 or 26 miles.

The other difficulties are so totally inexplicable, that Buffon, who seems to exert himself as much as possible in order to remove them, is obliged at last to own, that the earth is in a perishing state; that the hills will be levelled, and the ocean at last cover the whole face of the earth; a prophecy which wears no very favourable aspect to the inhabitants of this globe.—For these imaginations, however, there does not seem to be the smallest foundation in nature. The mountains have continued what they were, from the earliest accounts of time, without any signs of decay. Mount *Ætna*, besides the waste common to it with other mountains, hath been exhausting itself by throwing out incredible quantities of its own substance; yet it still seems to be what it was called by Pindar 2200 years ago, the *pillar of heaven*. It seems extremely probable, therefore, that there are powers in the system of nature which tend to preserve, and are capable of counteracting those which tend to destroy, the mountains; and per-

Earth.

171
Centrifugal force not the cause of the earth's spheroidal figure.

172
Natural powers for preserving the mountains.

Earth. happens the late discovery concerning the attraction of mountains may some time or other throw some light on the nature of these powers. See MOUNTAIN.

173
And
isthmuses.

The like may be said of the isthmuses or narrow necks of land which in some parts of the world join different countries together; such as the isthmus of Darien; of Suez, the Morea, &c. Though the ocean seems to beat on these with great violence, they are never diminished in bulk, or washed away, as, according to Buffon's theory, they ought to be. It is plain, therefore, that there is in nature some power by which these narrow necks of land are preserved from the fury of the ocean; for history does not afford one instance of any neck of land of this kind being broken down by the sea.—It seems impossible to solve the difficulties with regard to the strata and shells by any other means than supposing, that there are in the terrestrial matter several distinct powers, by which the strata of any particular kind are occasionally transformed into others; and that the shells and other marine bodies were originally deposited on the surface by the deluge. The volcanic hypothesis, by which some attempt to account for the appearance of these bodies, will in no shape answer the purpose. By the explosions of a volcano, shells, mud, sand, &c. might be indiscriminately thrown up, and scattered irregularly about; but we could never find the large beds of shells which are frequently to be met with of a considerable extent in different parts of the earth.

174
Notion of
a chaos
ought not
to be adopt-
ed.

With regard to any degree of certainty, it is scarcely to be hoped for on this subject. The common notion of the earth's being originally a chaos, seems neither to have a foundation in reason, nor in the Mosaic account of the creation. It is surely inconsistent with the wisdom ascribed to the Deity, to think that he would create this visible system in confusion, and then employ it to put itself in order. It seems more probable, that the earth was originally created with the inequalities of surface we see it have, and that the natural powers for preserving it were afterwards super-added. Thus, according to Moses, the first natural agent created, or produced, by directing matter to move in a certain manner, was *light*. This, we know, was absolutely necessary for the evaporation of the water which took place on the second day. Moses tells us, that the earth was originally covered with water: and we see a natural reason why it should be so; namely, that the evaporation by the atmosphere might more easily take place. When this was done, there being then no more occasion for the waters in that diffused state, they were commanded to retire into the place appointed for them, and thus formed the ocean. Whether this was done by the action of gravity then first taking place, or by any other means, we have it not in our power to know, nor will our speculations on this subject probably be attended with much benefit. We see, however, that the Mosaic account of the creation is perfectly consistent with itself, and free from those difficulties with which other systems are clogged. It is impossible to show, how, by any natural power, a confused mass of matter, such as the chaos of the ancient poets, of Drs Burnet and Woodward, the hollow globe of Mr Hutchinson, the comet of Mr Whiston, or the vitrified matter of M. Buffon, could put itself in the or-

der in which we see it. The sacred historian simply tells us, that God created the heavens and the earth; that the heavens gave no light, and the earth was covered with water. He first commanded the light to shine, then the air to take up what quantity of water he thought proper for the purposes of vegetation. After this, the dry land was made to appear; and the different powers of vegetation already taken notice of were given to it. Next the sun and moon were created as subordinate agents, to *divide the light from the darkness*, &c. Then followed the formation of animals and of man.

According to this account, it would appear, that what we call the *laws of nature*, were given to preserve the earth in that shape which the Deity thought proper to give it originally by his own power; and by no means to form it in any particular way, much less to put it out of the form which he had already given it: and thus the world, according to the best accounts we have, is very little altered in its appearance; and, according to what we can judge, will continue unaltered for ever, unless the Creator thinks proper to interpose in such a manner as to supersede all the laws he hath given it, and change it into some other form.

From some observations of Sir W. Hamilton and others, objections have been drawn, as hath been already mentioned, to the Mosaic chronology. These objections are in substance as follows. In pits, and other natural and artificial openings of the ground, in the neighbourhood of Vesuvius and Ætna, several beds of lava have been discovered at considerable depths below each other. These beds of lava in some places are covered with successive strata of vegetable mould. From this disposition of materials, Sir William concludes that the world must have been created at a much more remote period than is generally believed. The different strata of lava found below ground, he observes, must have proceeded from an equal number of eruptions from the mountain; and such of them as are covered with vegetable soil must have remained at least 1000 years on the surface before they could acquire a soil sufficient for the purposes of vegetation. Ten or twelve successive strata overlaid with soil have already been discovered in the bowels of the earth; and it has been strongly asserted, that, by digging deeper, many more might have been found. Now, allowing 1000 years for each stratum of lava, which the supporters of this theory affirm to be too little, the antiquity of the earth cannot be less than 12,000 years, which is more than double its age according to the Mosaic account.

The principal fact in this theory is, that 1000 years are necessary to the production of a soil sufficient for the nourishment and growth of vegetables upon volcanic lavas. This notion is confirmed by a conjecture of the Canonico Recupero, that streams of lava in Sicily have lain for centuries without acquiring a vegetable mould; and by some obscure accounts, that these lavas have proceeded from eruptions of Ætna above 1000 years ago. The following considerations, however, will render this theory at least extremely dubious.

Sir William informs us, that some lavas are very solid, and resist the operation of time much longer than another kind, which, he says, "is farinaceous, the particles separating as they force their way out, just like meal

Earth.

175
Mosaic ac-
count of the
creation
perfectly
consistent.

176
Objections
to the Mo-
saic chrono-
logy.

177
Answered.

Earth.

meal coming from under the grindstones. A stream of lava of this sort (he justly observes), being less compact, and containing more earthy particles, would certainly be much sooner fit for vegetation than one composed of the more perfect vitrified matter." He has not, however, ventured to determine whether these lavas found below ground were of the former or latter quality; a circumstance which materially affects the justness of his calculation.

That soil gradually increases by decayed vegetables, and the sediment deposited by snow and rain, is an undeniable fact. The thickness or thinness of soil indicates a greater or less time of accumulation. But Sir William has not informed us of the dimensions of his subterraneous vegetable strata; a circumstance of great moment in instituting a calculation of their different eras.

Besides, eruptions of volcanoes are often accompanied with incredible quantities of ashes, which fall thick upon all the ground for many miles round; intended by nature, it would appear, quickly to repair the barrenness occasioned by the lava. The muddy water sometimes thrown out may co-operate powerfully with the ashes in producing the same happy effect.

But Sir William has furnished us with facts of a more important nature. The town of Herculaneum was destroyed by an eruption in the 97th year of the Christian era. There are evident marks, says he, that the matter of six eruptions has taken its course over Herculaneum; for each of the six strata of lava is covered with a vein of good soil. Here we have Sir William's own authority for six strata of *good soil*, accumulated in less than 1700 years; which, supposing them to be all of equal thickness, instead of 1000 years, leaves not 300 to the production of each.

From the same authority we learn, that the crater on the top of the Monte Nuovo, or New Mountain, which was thrown up by subterraneous fire no farther back than the year 1538, is now covered with shrubs.

There is not on record any eruption from the great crater of Vesuvius from the year 1139 to 1631, a period of only 492 years. But Bracini, who descended into it not long before the 1631, tells us, "that the crater was five miles in circumference, and about 1000 paces deep. Its sides were covered with brushwood, and at the bottom there was a plain on which cattle grazed. In the woody parts, boars frequently harboured," &c.

The correspondence of these facts, related by Sir William himself, with his favourite notion that 1000 years are necessary for the production of a vegetable soil, we leave to the reader's consideration; and shall conclude with a few remarks of a different kind.

The appearance of a stratum of lava below ground, though not covered with vegetable soil, our author considers as demonstrative evidence, that such stratum formerly lay above the surface, and was thrown out by an eruption. This inference, however, seems not altogether just. Nothing, with propriety, receives the denomination of an eruption, unless when lava or other matter is vomited from the crater, or from some new opening made in the mountain. But it deserves notice, that, in the environs of volcanoes, earthquakes are fre-

quent. That these violent concussions are the genuine produce of subterraneous fire expanding itself in every direction, and making strong efforts against every substance which resists the natural tendency of its course, is a fact that cannot admit of doubt. It is no less certain, that these frequent concussions shake and dislocate the internal parts of the earth. They cannot fail to shatter and disarrange the natural direction of the original strata; and, of course, they must give rise to many subterraneous cavities and fissures. The nearer the great furnace, which confines the fury of the flames, the greater and more frequent will be the cavities. Every earthquake occasioned by a volcano is nothing else than an effort of the burning matter to enlarge the boundaries by which it is usually limited. If the quantity of matter and degree of inflammation require a space greatly superior to the internal cavities, an eruption above the surface is an infallible consequence: but when the quantity of matter, or the expansive force occasioned by the degree of inflammation, is insufficient to raise the lava to the top of the mountain, an earthquake may be produced; and the lava, without ever appearing above the surface, may run below ground in plentiful streams, and fill up all the subterraneous cavities and channels. These internal strata of lava may often lie so deep as to be below the level of the sea. In this manner, we conceive it to be not only possible, but extremely probable, that beds of lava, having no covering of vegetable soil, may be found at great depths, although they never were above the surface.

It is much more reasonable to conclude, that lavas with a layer of soil were produced by eruptions, and once lay above the surface, till covered by the operation of time, or subsequent streams from the mouth of the volcano. But even in this case, the argument is not altogether complete; for, as above remarked, earthquakes, with which countries adjacent to volcanoes are perpetually infested, often sink large tracts of land to great depths.

The other parts of the theory of the earth regard the situation of the different parts of its surface with respect to each other; its annual motion round the sun as a planet; its diurnal motion round its axis; and the different strata whereof it is composed, as far as it hath been hitherto found practicable to penetrate into it: for all which, see the articles GEOGRAPHY, ASTRONOMY, MINES, STRATA, &c.

Smell and Bath of the EARTH. See AGRICULTURE, n° 10.

Bread made of EARTH. See BREAD.

EARTH-Flax. See AMIANTHUS.

EARTH-Nuts, or Ground-Nuts, the roots of the *ARACHIS hypogæa* of Linnæus. They are composed of several small round bulbs or knobs; whence they were termed by Dodonæus, *terra glandes* or *earth-nuts*. They are esteemed an excellent food by the Siberians. In Holland likewise, they are sold in the markets and used for food. The native country of this plant seems to be Africa; though, at present, all the American settlements abound with it; but many persons who have resided in that country affirm that they were originally brought by the slaves from Africa. The plant multiplies very fast in a warm country; but being very impatient of cold, it cannot be propagated in the open

Earth.

Earth,
Earth-
quake.

air in Britain. The seeds must therefore be planted in a hot-bed in the spring of the year; and when the weather proves warm, they may be exposed to the open air by degrees. The branches of the plant trail upon the ground; and the flowers, which are yellow, are produced single upon long footstalks; and as soon as the flower begins to decay, the germen is thrust under ground, where the pod is formed and ripened; so that unless the ground is opened, they never appear: the roots are annual, but the nuts or seeds sufficiently stock the ground in a warm country where they are not carefully taken up.

EARTH-Nuts, or Pig-Nuts. See *BUNIUM*.

EARTH-Pucerons, in natural history, a name given by authors to a species of puceron very singular in its place of abode. In the month of March, if the turf be raised in several places in any dry pasture, there will be found, under some parts of it, clusters of ants; and, on a farther search, it will be usually found, that these animals are gathered about some pucerons of a peculiar species. These are large, and of a greyish colour, and are usually found in the midst of the clusters of ants.

The common abode of the several other species of pucerons is on the young branches or leaves of trees; as their only food is the sap or juice of vegetables, probably these *earth* kinds draw out those juices from the roots of the grasses, and other plants, in the same manner that the others do from the other parts. The ants that conduct us to these, are also our guides where to find the greater part of the others: the reason of which is, that as these creatures feed on the saccharine juices of plants, they are evacuated from their bodies in a liquid form, very little altered from their original state; and the ants, who love such food, find it ready prepared for them in the excrements which these little animals are continually voiding*. It has been supposed by some, that these were the common pucerons of other kinds, which had crept into the earth to preserve themselves from the rigour of the winter. But this does not appear to be the case; for they are usually met with in places very distant from trees or plants, on which they should be supposed before to have fed; and it is very certain, that though many of these insects are killed by the cold, yet many escape, and are found very early in the spring, sucking the buds of the peach-tree. There is no doubt of these creatures being in a feeding condition when under ground; because otherwise the ants would have no temptation to follow them: and it is equally certain, that the several species of the pucerons, like those of the caterpillar kinds, have each their peculiar herbs on which they feed, as many of them will die of hunger rather than feed on any others; and it is not at all likely, that these earth pucerons had been used to feed on leaves of trees and plants, and had left that food for the roots of grass.

EARTH-Worms. See *LUMBRICUS*.

EARTHQUAKE, in natural history, a sudden and violent concussion of the earth, generally attended with strange noises under-ground or in the air; often destroying whole cities at once, throwing down rocks, altering the course of rivers, and producing the most terrible devastations.

Though there is hardly any country known in which

shocks of an earthquake have not at some time or other been felt, yet there are some much more subject to them than others. It hath been observed, that northern countries in general are less subject to earthquakes than those situated near the equator, or in the southern latitudes; but this does not hold universally. The islands of Japan, which are situated pretty far north, are nevertheless exceedingly liable to these destructive phenomena. Islands, in general, are also more subject to earthquakes than continents; but neither does this hold without exceptions. Some particular parts of continents, and some particular islands, are more subject to them than others lying in the neighbourhood, and differing very little from them in external appearance. Thus, Portugal is more subject to earthquakes than Spain, and the latter much more than France; Mexico and Peru more than the other countries of America, and Jamaica more than the other Caribbee islands. Earthquakes are frequent, though not often violent, in Italy; but in Sicily they are often terribly destructive. Asia Minor has been remarkably subject to them from the remotest antiquity; and the city of Antioch in particular hath suffered more from earthquakes than any other in that country. The same phenomena are said also to occur very frequently in the north-eastern extremities of Asia, even in very high latitudes.

Though there are no phenomena in nature more calculated to impress the human mind with terror, and consequently to be well remembered and taken notice of, than earthquakes; yet the philosophy of them is but lately arrived at any degree of perfection; and even at this day, the history of earthquakes is very incomplete. The destruction occasioned by them engrosses the mind too much to admit of philosophical speculations at the time they happen: the same thing prevents the attentive consideration of the alterations that take place in the atmosphere after the earthquake is over, and which might probably throw some light on the causes which produced it; and the suddenness of its coming on prevents an exact attention to those slight appearances in the earth or air, which, if carefully observed, might serve as warnings to avoid the destruction.—From what observations have been made, however, the following phenomena may be deduced, and reckoned pretty certain.

1. Where there are any volcanoes or burning mountains, earthquakes may reasonably be expected more frequently than in other countries.

2. If the volcano hath been for a long time quiet, a violent earthquake is to be feared, & *vice versa*. But to this there are many exceptions.

3. Earthquakes are generally preceded by long droughts; but they do not always come on as soon as the drought ceases.

4. They are also preceded by electrical appearances in the air; such as the aurora borealis, falling stars, &c.: but this does not hold universally.

5. A short time before the shock, the sea swells up and makes a great noise; fountains are troubled, and send forth muddy water; and the beasts seem frightened, as if sensible of an approaching calamity.

6. The air at the time of the shock is generally calm and serene; but afterwards commonly becomes obscure and cloudy.

Earth-
quake.

What coun-
tries are
most subject
to earth-
quakes.

History of
their phe-
nomena in-
complete.

Account of
the pheno-
mena as far
as yet ascer-
tained.

7. The

* See *Aphis*,
and *Honey-*
deu.

Earth-
quake.

7. The shock comes on with a rumbling noise, sometimes like that of carriages; sometimes a rushing noise like wind, and sometimes explosions like the firing of cannon are heard. Sometimes the ground heaves perpendicularly upwards, and sometimes rolls from side to side. Sometimes the shock begins with a perpendicular heave, after which the other kind of motion commences. A single shock is but of very short duration, the longest scarcely lasting a minute; but they frequently succeed each other at short intervals for a considerable length of time.

8. During the shock, chasms are made in the earth; from which sometimes flames, but oftener great quantities of water, are discharged. Flame and smoke are also emitted from places of the earth where no chasms can be perceived. Sometimes these chasms are but small; but, in violent earthquakes, they are frequently so large, that whole cities sink down into them at once.

9. The water of the ocean is affected even more than the dry-land. The sea swells to a prodigious height; much more than we could suppose it raised by the mere elevation of its bottom by the shock. Sometimes it is divided to a considerable depth; and great quantities of air, flames, and smoke, are discharged from it. The like irregular agitations happen to the waters of ponds, lakes, and even rivers.

10. The shock is felt at sea as well as on land. Ships are affected by a sudden stroke, as if they had run aground or struck upon a rock.

11. The effects of earthquakes are not confined to one particular district or country, but often extend to very distant regions; though no earthquake hath yet been known extensive enough to affect the whole globe at one time. In those places also where the shock is not felt on dry land, the irregular agitation of the waters above mentioned is perceived very remarkably.

4
Account of
the earth-
quake in
Jamaica in
1692.

All these positions are verified by the accounts of those earthquakes which have been particularly described by witnesses of the best character. In 1692, an earthquake happened in Jamaica, attended with almost all the terrible circumstances above mentioned. In two minutes, it destroyed the town of Port Royal, at that time the capital of the island; and sunk the houses in a gulph 40 fathoms deep. It was attended with an hollow rumbling noise like that of thunder: the streets rose like the waves of the sea; first lifting up the houses, and then immediately throwing them down into deep pits. All the wells discharged their waters with the most violent agitation. The sea burst over its bounds, and deluged all that stood in its way. The fissures of the earth were in some places so great, that one of the streets appeared twice as broad as formerly. In many places it opened and closed again; and continued this agitation for some time. Of these openings, great numbers might be seen at once. In some of them, the people were swallowed up at once; in others, the earth caught them by the middle, and crushed them to death; while others, more fortunate, were swallowed up in one chasm, and thrown out alive by another. Other chasms were large enough to swallow up whole streets; and others, still more formidable, spouted up immense quantities of water, drowning such as the earthquake had spared. The whole was attended with stench and

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offensive smells, the noise of falling mountains at a distance, &c.; and the sky, in a minute's time, was turned dull and reddish, like a glowing oven. Yet, as great a sufferer as Port-Royal was, more houses were left standing therein than on the whole island besides. Scarce a planting-house, or sugar-house, was left standing in all Jamaica. A great part of them were swallowed up, houses, people, trees, and all, in one gap: in lieu of which, afterwards appeared great pools of water; which, when dried up, left nothing but sand, without any mark that ever tree or plant had grown thereon. The shock was so violent, that it threw people down on their knees or their faces as they were running about for shelter. Several houses were shuffled some yards out of their places, and yet continued standing. One Hopkins had his plantation removed half a mile from the place where it stood, without any considerable alteration. All the wells in the island, as well as those of Port-Royal, from one fathom to six or seven deep, threw their water out at the top with great violence. Above 12 miles from the sea, the earth gaped and spouted out, with a prodigious force, vast quantities of water into the air: yet the greatest violences were among the mountains and rocks; and it is a general opinion, that the nearer the mountains, the greater the shock; and that the cause thereof lay among them. Most of the rivers were stopped up for 24 hours by the falling of the mountains; till swelling up, they made themselves new tracks and channels; tearing up, in their passage, trees, &c. After the great shock, those people who escaped got on board ships in the harbour, where many continued above two months; the shocks all that time being so violent, and coming so thick, sometimes two or three in an hour, accompanied with frightful noises like a rushing wind, or a hollow rumbling thunder, with brimstone-blasts, that they durst not come ashore. The consequence of the earthquake was a general sickness, from the noisome vapours belched forth, which swept away above 3000 persons.

A still more terrible account, if possible, is that given by Kircher, of the earthquake which happened in Calabria in the year 1638. This instance is an exception to the second general position above laid down. In Italy, there had been an eruption of Mount Vesuvius five years before; and in Sicily there had been an eruption of *Ætna* only two years before this earthquake. The event, however, plainly showed, that the cause of the earthquake, whatever it was, had a connection not only with Mount *Ætna*, which lies in the neighbourhood, but also with the volcano of Stromboli, which is 60 miles distant. "On the 24th of March (says Kircher), we lunched (in a small boat) from the harbour of Messina in Sicily, and arrived the same day at the promontory of Pelorus. Our destination was for the city of Euphemia in Calabria; but on account of the weather, we were obliged to continue three days at Pelorus. At length, wearied with the delay, we resolved to prosecute our voyage; and although the sea seemed more than usually agitated, yet we ventured forward. The gulph of Charybdis, which we approached, seemed whirled round in such a manner as to form a vast hollow, verging to a point in the centre. Proceeding onward, and turning my eyes to Mount *Ætna*, I saw it cast forth large volumes of smoke, of

Earth-
quake.

5
Of the
earthquake
in Calabria
in 1638.

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Earth-
quake.

mountainous size, which entirely covered the island, and blotted out even the shores from my view. This, together with the dreadful noise, and the sulphureous stench, which was strongly perceived, filled me with apprehensions that some more dreadful calamity was impending. The sea itself seemed to wear a very unusual appearance; those who have seen a lake in a violent shower of rain all covered over with bubbles, will have some idea of its agitations. My surprise was still increased by the calmness and serenity of the weather; not a breeze, not a cloud, which might be supposed to put all nature thus into motion. I therefore warned my companion, that an earthquake was approaching; and, after some time, making for the shore with all possible diligence, we landed at Tropæa. But we had scarce arrived at the Jesuits college in that city, when our ears were stunned with an horrid sound, resembling that of an infinite number of chariots driven fiercely forward, the wheels rattling and the thongs cracking. Soon after this, a most dreadful earthquake ensued; so that the whole track upon which we stood seemed to vibrate, as if we were in the scale of a balance that continued waving. This motion, however, soon grew more violent; and being no longer able to keep my legs, I was thrown prostrate upon the ground. After some time, finding that I remained unhurt amidst the general concussion, I resolved to venture for safety; and running as fast as I could, reached the shore. I did not search long here, till I found the boat in which I had landed, and my companions also. Leaving this seat of desolation, we prosecuted our voyage along the coast; and the next day came to Rochetta, where we landed, although the earth still continued in violent agitations. But we were scarce arrived at our inn, when we were once more obliged to return to our boat; and in about half an hour we saw the greatest part of the town, and the inn at which we had set up, dashed to the ground, and burying all its inhabitants beneath its ruins. Proceeding onward in our little vessel, we at length landed at Lopizium, a little mid-way between Tropæa and Euphemia the city to which we were bound. Here, wherever I turned my eyes, nothing but scenes of ruin and horror appeared; towns and castles levelled to the ground; Stromboli, though at 60 miles distance, belching forth flames in an unusual manner, and with a noise which I could distinctly hear. But my attention was quickly turned from more remote to contiguous danger. The rumbling sound of an approaching earthquake, which by this time we were grown acquainted with, alarmed us for the consequences. It every moment seemed to grow louder, and to approach more near. The place on which we stood now began to shake most dreadfully; so that, being unable to stand, my companions and I caught hold of whatever shrub grew next us, and supported ourselves in that manner. After some time, the violent paroxysm ceasing, we again stood up, in order to prosecute our voyage to Euphemia, which lay within sight. In the mean time, while we were preparing for this purpose, I turned my eyes towards the city; but could see only a frightful dark cloud, that seemed to rest upon the place. This the more surprised us, as the weather was so very serene. We waited, therefore, till the cloud was passed away: then turning to look for the city, it was totally sunk; and

nothing but a dismal and putrid lake was to be seen where it stood."

Earth-
quake.

In 1693 an earthquake happened in Sicily, which may justly be accounted one of the most terrible of which we have any account. It shook the whole island: and not only that, but Naples and Malta shared in the shock. It was impossible for any body in this country to keep on their legs on the dancing earth; nay, those that lay on the ground were tossed from side to side as on a rolling billow: high walls leaped from their foundations several paces, &c. The mischief it did is amazing; almost all the buildings in the countries were thrown down. Fifty-four cities and towns, beside an incredible number of villages, were either destroyed or greatly damaged. We shall only instance the fate of Catania, one of the most famous, ancient, and flourishing cities in the kingdom; the residence of several monarchs, and an university. This once famous city had the greatest share in the tragedy. Father Anthon. Serrovita, being on his way thither, and at the distance of a few miles, observed a black cloud like night hovering over the city; and there arose from the mouth of Montgibello great spires of flame, which spread all around. The sea all of a sudden began to roar and rise in billows; and there was a blow, as if all the artillery in the world had been at once discharged. The birds flew about astonished; the cattle in the fields ran crying, &c. His and his companions horses stopped short, trembling; so that they were forced to alight. They were no sooner off, but they were lifted from the ground above two palms; when casting his eyes towards Catania, he with amazement saw nothing but a thick cloud of dust in the air. This was the scene of their calamity; for of the magnificent Catania, there was not the least footstep to be seen. S. Bonajutus assures us, that of 18900 inhabitants, 18000 perished therein.

The great earthquake, however, which happened on the 1st of November 1755, affords the clearest example of all the phenomena above mentioned; having been felt violently in many places both on land and at sea, and extended its effects to the waters in many other places where the shocks were not perceived. At Lisbon in Portugal its effects were most severe. In 1750, there had been a sensible trembling of the earth felt in this city: for four years afterwards, there had been an excessive drought; insomuch that some springs, formerly very plentiful of water, were dried and totally lost. The predominant winds were north and north-east, accompanied with various, though very small, tremors of the earth. The year 1755 proved very wet and rainy; the summer cooler than usual; and for 40 days before the earthquake, the weather was clear, but not remarkably so. The last day of October, the sun was obscured, with a remarkable gloominess in the atmosphere. The first of November, early in the morning, a thick fog arose, which was soon dissipated by the heat of the sun; no wind was stirring; the sea was calm; and the weather as warm as in June or July in this country. At 35 minutes after nine, without the least warning, except a rumbling noise not unlike the artificial thunder in our theatres, a most dreadful earthquake shook, by short but quick vibrations, the foundations of all the city, so that many buildings instantly fell. Then, with a scarce perceptible pause, the nature of the motion

Phenomena
of the great
earthquake,
Novem. 1.8
At Lisbon.

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Earth-
quake.

was changed, and the houses were tossed from side to side, with a motion like that of a waggon violently driven over rough stones. This second shock laid almost the whole city in ruins, with prodigious slaughter of the people. The earthquake lasted in all about six minutes. At the moment of its beginning, some persons on the river, near a mile from the city, heard their boat make a noise as if it had run aground, though they were then in deep water; and at the same time they saw the houses falling on both sides of the river. The bed of the river Tagus was in many places raised to its surface. Ships were driven from their anchors, and jostled together with great violence; nor did their masters know whether they were afloat or aground. A large new quay sunk to an unfathomable depth, with several hundreds of people who were upon it; nor was one of the dead bodies ever found. The bar was at first seen dry from shore to shore: but suddenly the sea came rolling in like a mountain; and about Belem Castle the water rose 50 feet almost in an instant. About noon there was another shock; when the walls of several houses that yet remained were seen to open from top to bottom more than a quarter of a yard, and afterwards closed again so exactly that scarce any mark of the injury was left.

At Colares.

At Colares, about 20 miles from Lisbon, and two miles from the sea, on the last day of October, the weather was clear, and uncommonly warm for the season. About four o'clock in the afternoon there arose a fog, which came from the sea, and covered the valleys; a thing very unusual at that season of the year. Soon after, the wind changing to the east, the fog returned to the sea, collecting itself, and becoming exceeding thick. As the fog retired, the sea rose with a prodigious roaring. The first of November, the day broke with a serene sky, the wind continuing at east; but about nine o'clock the sun began to grow dim; and about half an hour after was heard a rumbling noise like that of chariots, which increased to such a degree, that it became equal to the explosions of the largest cannon. Immediately a shock of an earthquake was felt, which was quickly succeeded by a second and third; and at the same time several light flames of fire issued from the mountains, resembling the kindling of charcoal. In these three shocks, the walls of the buildings moved from east to west. In another situation, from whence the sea-coast could be discovered, there issued from one of the hills called the *Fojo* a great quantity of smoke, very thick, but not very black. This still increased with the fourth shock, and afterwards continued to issue in a greater or less degree. Just as the subterraneous rumblings were heard, the smoke was observed to burst forth at the *Fojo*; and the quantity of smoke was always proportioned to the noise. On visiting the place from whence the smoke was seen to arise, no signs of fire could be perceived near it.

At Oporto.

At Oporto (near the mouth of the river Douro), the earthquake began about 40 minutes past nine. The sky was very serene; when a dreadful hollow noise like thunder, or the rattling of coaches at a distance, was heard, and almost at the same instant the earth began to shake. In the space of a minute or two, the river rose and fell five or six feet, and continued to do so for four hours. It ran up at first with so much violence, that it broke a ship's hawser. In some parts the river

opened, and seemed to discharge vast quantities of air; and the agitation in the sea was so great about a league beyond the bar, that air was supposed to have been discharged there also.

St Ube's, a sea-port town about 20 miles south of Lisbon, was entirely swallowed up by the repeated shocks and the vast surf of the sea. Huge pieces of rock were detached at the same time from the promontory at the west end of the town, which consists of a chain of mountains containing fine jasper of different colours.

The same earthquake was felt all over Spain, except in Catalonia, Arragon, and Valencia.—At Ayamonte (near where the Guadiana falls into the Bay of Cadiz), a little before 10 o'clock on the first of November, the earthquake was felt; having been immediately preceded by a hollow rushing noise. Here the shocks continued for 14 or 15 minutes, damaged almost all the buildings, throwing down some, and leaving others irreparably shattered. In little more than half an hour after, the sea and river, with all the canals, overflowed their banks with great violence, laying under water all the coasts of the islands adjacent to the city and its neighbourhood, and flowing into the very streets. The water came on in vast black mountains, white with foam at the top, and demolished more than one half of a tower at the bar named *De Canala*. In the adjacent strands every thing was irrecoverably lost; for all that was overflowed sunk, and the beach became a sea, without the least resemblance of what it was before. Many persons perished; for although they got aboard some vessels, yet part of these foundered; and others being forced out to sea, the unhappy passengers were so terrified, that they threw themselves overboard. The day was serene, and not a breath of wind stirring.

At Cadiz, some minutes after nine in the morning, the earthquake began, and lasted about five minutes. The water of the cisterns under ground washed backwards and forwards, so that a great froth arose. At ten minutes after eleven, a wave was seen coming from the sea, at eight miles distance, at least 60 feet higher than usual. It dashed against the west part of the town, which is very rocky. Though these rocks broke a good deal of its force, it at last came upon the city walls, beat in the breast-work, and carried pieces of the building of eight or ten ton weight to the distance of 40 or 50 yards.—When the wave was gone, some parts that are deep at low water, were left quite dry; for the water returned with the same violence with which it came. At half an hour after 11 came a second wave, and after that four other remarkable ones; the first at ten minutes before twelve; the second, half an hour before one; the third, ten minutes after one; and the fourth, ten minutes before two. Similar waves, but smaller, and gradually lessening, continued with uncertain intervals till the evening.

At Gibraltar, the earthquake was not felt till after ten. It began with a tremulous motion of the earth, which lasted about half a minute. Then followed a violent shock; after that, a trembling of the earth for five or six seconds; then another shock not so violent as the first, which went off gradually as it began. The whole lasted about two minutes. Some of the guns on the battery were seen to rise, others to sink, the earth having an undulating motion. Most people were seized with giddiness and sickness, and some fell down; others

Earth-
quake.

11

At St Ube's.

12

At Ayamonte in Spain.

13

At Cadiz.

14

At Gibraltar.

Earth-
quake.

were stupified; and many that were walking or riding felt no motion in the earth, but were sick. The sea rose six feet every 15 minutes; and then fell so low, that boats and all the small craft near the shore were left a-ground, as were also numbers of small fish. The flux and reflux lasted till next morning, having decreased gradually from two in the afternoon.

15
At Madrid,
Malaga,
&c.

At Madrid the earthquake came on at the same time as at Gibraltar, and lasted about six minutes. At first every-body thought they were seized with a swimming in their heads; and afterwards, that the houses were falling. It was not felt in coaches, nor by those who walked on foot, except very slightly; and no accident happened, except that two lads were killed by the fall of a stone-cross from the porch of a church.

Malaga (a sea-port on the Mediterranean) felt a violent shock; the bells rung in the steeples; the water of a well overflowed, and as suddenly retired.

Saint Lucar (at the mouth of the Guadalquivir) was violently shocked, and the sea broke in and did a great deal of mischief.

At Seville (16 leagues above the mouth of the Guadalquivir) several houses were shaken down; the famous tower of the cathedral called *La Giralda* opened in the four sides; and the waters were so violently agitated, that all the vessels in the river were driven ashore.

16
At Arzilla
in Africa.

In Africa, the earthquake was felt almost as severely as it had been in Europe. Great part of the town of Algiers was destroyed. At Arzilla (a town in the kingdom of Fez), about ten in the morning, the sea suddenly rose with such impetuosity, that it lifted up a vessel in the bay, and dropped it with such force on the land, that it was broke to pieces; and a boat was found two musket-shot within land from the sea. At Fez and Mequinez, great numbers of houses fell down, and a multitude of people were buried in the ruins.

17
At Morocco.

At Morocco, by the falling down of a great number of houses, many people lost their lives: and about eight leagues from the city the earth opened and swallowed up a village with all the inhabitants, who were known by the name of the *Sons of Besumba*, to the number of about 8000 or 10,000 persons, together with all their cattle, &c.; and, soon after, the earth closed again in the same manner as before.

18
At other
places on
the African
coast.

At Salle, a great deal of damage was done. Near a third part of the houses were overthrown; the waters rushed into the city with great rapidity, and left behind them great quantities of fish.

At Tangier, the earthquake began at ten in the morning, and lasted 10 or 12 minutes. The sea came up to the walls (a thing never heard of before); and went down immediately with the same rapidity with which it arose, leaving a great quantity of fish behind it. These commotions were repeated 18 times, and lasted till six in the evening.

At Tetuan, the earthquake began at the same time it did at Tangier, but lasted only seven or eight minutes. There were three shocks so extremely violent, that it was feared the whole city would be destroyed.

19
In the island
of Madeira.

In the city of Funchal, in the island of Madeira, a shock of this earthquake was first perceived at 38 minutes past nine in the morning. It was preceded by a rumbling noise in the air, like that of empty carriages passing hastily over a stone pavement. The observer

felt the floor immediately to move with a tremulous motion, vibrating very quickly. The shock continued more than a minute; during which space, the vibrations, though continual, were weakened and increased in force twice very sensibly. The increase after the first remission of the shock was the most intense. The noise in the air accompanied the shock during the whole of its continuance, and lasted some seconds after the motion of the earth had ceased; dying away like a peal of distant thunder rolling through the air. At three quarters past eleven, the sea, which was quite calm, it being a fine day, and no wind stirring, retired suddenly some paces; then rising with a great swell without the least noise, and as suddenly advancing, overflowed the shore, and entered the city. It rose 15 feet perpendicular above the high-water mark, although the tide, which flows there seven feet, was then at half ebb. The water immediately receded; and after having fluctuated four or five times between high and low water mark, it subsided, and the sea remained calm as before. In the northern part of the island the inundation was more violent, the sea there retiring above 100 paces at first, and suddenly returning, overflowed the shore, forcing open doors, breaking down the walls of several magazines and storehouses, leaving great quantities of fish ashore and in the streets of the village of Machico. All this was the effect of one rising of the sea, for it never afterwards flowed high enough to reach the high-water mark. It continued, however, to fluctuate here much longer before it subsided than at Funchal; and in some places farther to the westward, it was hardly, if it all, perceptible.

These were the phenomena with which this remarkable earthquake was attended in those places where it was violent. The effects of it, however, reached to an immense distance; and were perceived chiefly by the agitations of the waters, or some slight motion of the earth. The utmost boundaries of this earthquake to the south are unknown; the barbarity of the African nations rendering it impossible to procure any intelligence from them, except where the effects were dreadful. On the north, however, we are assured, that it reached as far as Norway and Sweden. In the former, it in the waters of several rivers and lakes were violently agitated. In the latter, shocks were felt in several provinces, and all the rivers and lakes were strongly agitated, especially in Dalecarlia. The river Dala suddenly overflowed its banks, and as suddenly retired. At the same time a lake at the distance of a league from it, and which had no manner of communication with it, bubbled up with great violence. At Fahlun, a town in Dalecarlia, several strong shocks were felt.

In many places of Germany the effects of the earthquake were very perceptible. Throughout the duchy of Holstein, the waters were violently agitated, particularly those of the Elbe and Trave. In Brandenburg, the water of a lake called *Libsee*, ebbed and flowed six times in half an hour, with a dreadful noise, the weather being then perfectly calm. The same agitation was observed in the waters of the lakes called *Muplgast* and *Netzo*; but at this last place they also emitted an intolerable stench.

In Holland, the agitations were more remarkable. At

Earth-
quake.

20
Effects of
way and
Sweden.

21
In Ger-
many.

22
In Holland.

Earth-
quake.

At Alphen on the Rhine between Leyden and Woerden, in the afternoon of the first of November, the waters were agitated to such a violent degree, that buoys were broken from their chains, large vessels snapped their cables, smaller ones were thrown out of the water upon the land, and others lying on land were set afloat. At Amsterdam, about eleven in the forenoon, the air being perfectly calm, the waters were suddenly agitated in their canals, so that several boats broke loose; chandeliers were observed to vibrate in the churches; but no motion of the earth, or concussion of any building, was observed. At Haerlem, in the forenoon, for near four minutes together, not only the water in the rivers, canals, &c. but also all kinds of fluids in smaller quantities, as in coolers, tubs, backs, &c. were surprisingly agitated, and dashed over the sides, though no motion was perceptible in the vessels themselves. In these small quantities also the fluid apparently ascended prior to its turbulent motion; and in many places, even the rivers and canals rose 12 inches perpendicular. At Leyden, between half an hour after 10 and 11 in the forenoon, the waters rose suddenly in some of the canals, and made several very sensible undulations, so that the boats were strongly agitated. The same motion was perceived in the water of the backs of two brew-houses.

Round the island of Corsica, the sea was violently agitated, and most of the rivers of the island overflowed their banks.—In the city of Milan in Italy, and throughout that district, shocks were felt. At Turin in Savoy, there was felt a very violent shock.

23
In Italy and
Switzer-
land.

In Switzerland, many rivers turned suddenly muddy without rain. The lake of Neufchatel swelled to the height of near two feet above its natural level for the space of a few hours. An agitation was also perceived in the waters of the lake of Zurich.

24
At Antigua and
Barbadoes.

At the island of Antigua, there was such a sea without the bar as had not been known in the memory of man; and after it, all the water at the wharfs, which used to be six feet deep, was not two inches.—At Barbadoes, about two in the afternoon, the sea ebbed and flowed in a surprising manner. It ran over the wharfs and streets into the houses, and continued thus ebbing and flowing till ten at night.

25
In England

The agitation of the waters was perceived in great numbers of places in Great Britain and Ireland.—Accounts of the most remarkable of them follow. At Barlborough in Derbyshire, between 11 and 12 in the forenoon, in a boat-house on the west side of a large body of water called *Pibley Dam*, supposed to cover at least 30 acres of land, was heard a surprising and terrible noise; a large swell of water came in a current from the south, and rose two feet on the sloped dam-head at the north end of the water. It then subsided; but returned again immediately, though with less violence. The water was thus agitated for three quarters of an hour; but the current grew every time weaker and weaker, till at last it entirely ceased.

At Busbridge in Surrey, at half an hour after ten in the morning, the weather being remarkably still, without the least wind, in a canal near 700 feet long and 58 feet broad, with a small spring constantly running through it, a very unusual noise was heard at the east end, and the water there observed to be in great agitation. It raised itself in a heap or ridge in the

middle; and this heap extended lengthwise about 30 yards, rising between two or three feet above the usual level. After this, the ridge heeled or vibrated towards the north side of the canal with great force, and flowed above eight feet over the grass walk on that side. On its return back into the canal, it again ridged in the middle, and then heeled with yet greater force to the south side, and flowed over its grass walk. During this latter motion, the bottom on the north side was left dry for several feet. This appearance lasted for about a quarter of an hour, after which the water became smooth and quiet as before. During the whole time, the sand at the bottom was thrown up and mixed with the water; and there was a continual noise like that of water turning a mill.

At Cobham in Surrey, between 10 and 11 o'clock, a person was watering a horse at a pond fed by springs. Whilst the animal was drinking, the water suddenly ran away from him, and moved towards the south with such swiftness, that the bottom of the pond was left bare. It returned again with such impetuosity, that the man leaped backwards to secure himself from its sudden approach. The ducks were alarmed at the first agitation, and instantly flew all out of the pond.

At Dunstall in Suffolk, the water of a pond rose gradually for several minutes in the form of a pyramid, and fell down like a water-spout. Other ponds in the neighbourhood had a smooth flux and reflux from one end to the other.

Near the city of Durham, about half an hour after ten, a gardener was alarmed by a sudden rushing noise from a pond, as if the head of the pond had been broken down: when casting his eye on the water, he saw it gradually rise up, without any fluctuating motion, till it reached a grate which stood some inches higher than the common water level. After this it subsided, and then swelled again; thus continuing to rise and fall during the space of six or seven minutes, making four or five returns in the space of one minute. The pond was about 40 yards long and 10 broad.

At Early Court, Berks, about 11 o'clock, as a gardener was standing by a fish pond, he felt a violent trembling of the earth, which lasted about a minute. Immediately after, he observed a motion of the water from the south to the north end of the pond, leaving the bottom at the south end altogether dry for about six feet. It then returned, and flowed at the south end, rising three feet up the slope bank; and immediately after returned to the north bank, rising there also about three feet. In the time between the flux and reflux, the water swelled up in the middle of the pond, collected in a ridge about 20 inches higher than the level on each side, and boiled like a pot. This agitation from south to north lasted about four minutes.

At Eaton-bridge, Kent, in a pond about an acre in size, a dead calm, and no wind stirring, some persons heard a noise, and imagining something had been tumbling in, ran to see what was the matter. On their arrival at the pond, to their surprise they saw the water open in the middle, so that they could see a post a good way down, almost to the bottom. The water in the mean time dashed up over a bank two feet high, and perpendicular to the pond. This was repeated several times with a great noise.

Earth-
quake.

Earth-
quake.

At Eyam-bridge, Derbyshire (in the Peak), the overseer of the lead-mines sitting in his writing-room about 11 o'clock, felt a sudden shock, which very sensibly raised him up in his chair, and caused several pieces of plaster to drop from the sides of the room. The roof was so violently shaken, that he imagined the engine shaft had been falling in. Upon this he immediately ran to see what was the matter, but found every thing in perfect safety.—At this time two miners were employed in carting, or drawing along the drifts of the mines, the ore and other materials to be raised up at the shafts. The drift in which they were working was about 120 yards deep, and the space from one end to the other 50 yards or upwards. The miner at the end of the drift had just loaded his cart, and was drawing it along; but he was suddenly surprised by a shock, which so terrified him, that he immediately quitted his employment, and ran to the west end of the drift to his partner, who was no less terrified than himself. They durst not attempt to climb the shaft, lest that should be running in upon them: but while they were consulting what means they should take for their safety, they were surprised by a second shock more violent than the first; which frightened them so much, that they both ran precipitately to the other end of the drift. They then went down to another miner who worked about 12 yards below them. He told them that the violence of the second shock had been so great, that it caused the rocks to grind upon one another. His account was interrupted by a third shock, which, after an interval of four or five minutes, was succeeded by a fourth; and, about the same space of time after, by a fifth; none of which were so violent as the second. They heard, after every shock, a loud rumbling in the bowels of the earth, which continued about half a minute, gradually decreasing, or seeming to remove to a greater distance.

At Shireburn castle, Oxfordshire, at a little after ten in the morning, a very strange motion was observed in the water of a moat which encompasses the house. There was a pretty thick fog, not a breath of air, and the surface of the water all over the moat as smooth as a looking-glass, except at one corner, where it flowed into the shore, and retired again successively, in a surprising manner. In what manner it began to move is uncertain, as nobody observed the beginning of its motion. The flux and reflux, when seen, were quite regular. Every flood began gently; its velocity increased by degrees, when at last it rushed in with great impetuosity, till it had attained its full height. Having remained for a little time stationary, it then retired, ebbing gently at first, but afterwards sinking away with great swiftness. At every flux, the whole body of water seemed to be violently thrown against the bank; but neither during the time of the flux nor that of the reflux, did there appear even the least wrinkle of a wave on the other parts of the moat. Lord Viscount Parker, who had observed this motion, being desirous to know whether it was universal over the moat, sent a person to the other corner of it, at the same time that he himself stood about 25 yards from him, to examine whether the water moved there or not. He could perceive no motion there, or hardly any: but another, who went to the north-east corner of the moat, diagonally opposite to his lordship,

found it as considerable there as where he was. His lordship imagining, that in all probability the water at the corner diagonally opposite to where he was would sink as that by him rose, he ordered the person to signify by calling out, when the water by him began to sink, and when to rise. This he did; but, to his lordship's great surprise, immediately after the water began to rise at his own end, he heard his voice calling that it began to rise with him also; and in the same manner he heard that it was sinking at his end, soon after he perceived it to sink by himself. A pond just below was agitated in a similar manner; but the risings and sinkings of it happened at different times from those at the pond where lord Parker stood.

At White Rock in Glamorganshire, about two hours ebb of the tide, and near three quarters after six in the evening, a vast quantity of water rushed up with a prodigious noise; floated two large vessels, the least of them above 200 tons; broke their moorings, drove them across the river, and had like to have upset them. The whole rise and fall of this extraordinary body of water did not last above ten minutes, nor was it felt in any other part of the river, so that it seemed to have gushed out of the earth at that place.

At Loch Lomond in Scotland, about half an hour after nine in the morning, all of a sudden, without the least gust of wind, the water rose against its banks with great rapidity, but immediately subsided, till it was as low in appearance as any body then present had ever seen it in the greatest summer-drought. Instantly it returned towards the shore, and in five minutes time rose again as high as before. The agitation continued at the same rate till 15 minutes after ten the same morning; taking five minutes to rise, and as many to subside. From 15 minutes after 10 till 11, the height of every rise came somewhat short of that immediately preceding, taking five minutes to flow, and as many to ebb, till the water was entirely settled. The greatest perpendicular height of this swell was two feet four inches. A still more remarkable phenomenon attending the earthquake in this lake was, that a large stone lying at some distance from shore, but in such shallow water that it could easily be seen, was forced out of its place in the lake upon dry land, leaving a deep furrow in the ground all along the way in which it had moved.

In Loch Ness, about half an hour after nine, a very great agitation was observed in the water. About ten the river Oich, which runs on the north side of Fort Augustus, into the head of the loch, was observed to swell very much, and run upwards from the loch with a pretty high wave, about two or three feet higher than the ordinary surface. The motion of the wave was against the wind, and it proceeded rapidly for about 200 yards up the river. It then broke on a shallow, and flowed three or four feet on the banks, after which it returned gently to the loch. It continued ebbing and flowing in this manner for about an hour, without any such remarkable waves as the first; but about 11 o'clock, a wave higher than any of the rest came up, and broke with so much force on the low ground on the north side of the river, that it run upon the grass upwards of 30 feet from the river's bank.

At Kinfale, between two and three in the afternoon, the weather being very calm, and the tide near full, a large

Earth-
quake.

26

In Scot-

27

In Ireland.

Earth-
quake.

large body of water suddenly poured into the harbour with such rapidity, that it broke the cables of two sloops, each moored with two anchors, and of several boats lying between Sicily and the town. But just at the time that a great deal of mischief was apprehended by all the vessels running foul of each other, an eddy whirled them round several times, and then hurried them back again with the same rapidity as before. This was several times repeated; and while the current rushed up at one side of the harbour, it poured down with equal violence at the other. A vessel that lay all this time in the pool did not seem to be any ways affected by it; nor was the violence of the currents much perceived in the deeper parts of the harbour, but raged with most violence on the flats. The bottom of the harbour, which is muddy, was much altered; the mud being washed from some places, and deposited in others. The perpendicular rise of the water at one quay was measured, and found to be five feet and an half; and is said to have been much higher at another, where it overflowed, and poured into the market-place with such rapidity, that some people who were on the quay immediately ran off, and yet could not prevent themselves from being overtaken and immersed knee-deep in the water. The agitations extended several miles up the river; but, as in the harbour, were most perceived in the shallowest places. The successive risings and fallings of the water continued about ten minutes, and then the tide returned to its natural course. Between six and seven in the evening, the water rose again, though not with so great violence as before, and it continued to ebb and flow alternately till three in the morning. The waters did not rise gradually at first; but, with a hollow and horrid noise, rushed in like a deluge, rising six or seven feet in a minute, and as suddenly subsiding. They were as thick as puddle, very black, and stank intolerably.—From different accounts it appeared, that the water was affected in a similar manner all along the coast to the westward of Kinsale.

28
In France.

In France, shocks were perceived in several places; as at Bayonne, Bourdeaux, and Lyons. Commotions of the waters also were observed at Angoulesme, Bleville, Havre de Grace, &c. but not attended with the remarkable circumstances above mentioned.

29
Its effects
on springs,
and on the
earth itself.

These are the most striking phenomena with which the earthquake of Nov. 1. 1755 was attended on the surface of the earth. Those which happened below ground cannot be known but by the changes observed in springs, &c. which were in many places very remarkable.—At Colares, on the afternoon of the 31st of October, the water of a fountain was greatly decreased: on the morning of the first of November it ran very muddy; and, after the earthquake, returned to its usual state both as to quantity and clearness. On the hills, numbers of rocks were split; and there were several rents in the ground, but none considerable. In some places where formerly there had been no water, springs burst forth, which continued to run.—Some of the largest mountains in Portugal were impetuously shaken as it were from their foundation; most of them opened at their summits, split and rent in a wonderful manner, and huge masses of them were thrown down into the subjacent valleys.—From the rock called *Pedra de Alvidar*, near the hill Fojo, a kind of parapet

was broken off, which was thrown up from its foundation in the sea.—At Varge, on the river Macaas, at the time of the earthquake, many springs of water burst forth, some spouted to the height of 18 or 20 feet, throwing up sand of various colours, which remained on the ground. A mountainous point, seven or eight leagues from St Ube's, cleft asunder, and threw off several vast masses of rock.—In Barbary, a large hill was rent in two; the two halves fell different ways, and buried two large towns. In another place, a mountain burst open, and a stream issued from it as red as blood. At Tangier, all the fountains were dried up, so that there was no water to be had till night.—A very remarkable change was observed on the medicinal waters of Toplitz, a village in Bohemia famous for its baths. These waters were discovered in the year 762; from which time the principal spring of them had constantly thrown out hot water in the same quantity, and of the same quality. On the morning of the earthquake, between 11 and 12 in the forenoon, the principal spring cast forth such a quantity of water, that in the space of half an hour all the baths ran over. About half an hour before this great increase of the water, the spring flowed turbid and muddy; then having stopped entirely for a minute, it broke forth again with prodigious violence, driving before it a considerable quantity of reddish ochre. After this it became clear, and flowed as pure as before. It still continues to do so; but the water is in greater quantity, and hotter, than before the earthquake. At Angoulesme in France, a subterraneous noise like thunder was heard; and presently after the earth opened, and discharged a torrent of water mixed with red sand. Most of the springs in the neighbourhood sunk in such a manner, that for some time they were thought to be quite dry. In Britain, no considerable alteration was observed in the earth, except that, near the lead mine above mentioned in Derbyshire, a cleft was observed about a foot deep, six inches wide, and 150 yards in length.

Earth-
quake.

At sea, the shocks of this earthquake were felt most violently. Off St Lucar, the captain of the Nancy frigate felt his ship so violently shaken, that he thought she had struck the ground; but, on heaving the lead, found he was in a great depth of water. Captain Clark from Denia, in N. Lat. 36. 24. between nine and ten in the morning, had his ship shaken and strained as if she had struck upon a rock, so that the seams of the deck opened, and the compass was overturned in the binnacle. The master of a vessel bound to the American islands, being in N. Lat. 25°, W. Long. 40°, and writing in his cabin, heard a violent noise, as he imagined, in the steerage; and while he was asking what the matter was, the ship was put into a strange agitation, and seemed as if she had been suddenly jerked up and suspended by a rope fastened to the mast-head. He immediately started up with great terror and astonishment; and looking out at the cabin-window, saw land, as he took it to be, at the distance of about a mile. But, coming upon the deck, the land was no more to be seen, but he perceived a violent current cross the ship's way to the leeward. In about a minute, this current returned with great impetuosity, and at a league's distance he saw three craggy-pointed rocks throwing up water of various colours resembling fire.

30
Effects of
the earth-
quake at
sea.

Earth-
quake.

fire. This phenomenon, in about two minutes, ended in a black cloud, which ascended very heavily. After it had risen above the horizon, no rocks were to be seen; though the cloud, still ascending, was long visible, the weather being extremely clear.—Between nine and ten in the morning, another ship, 40 leagues west of St Vincent, was so strongly agitated, that the anchors, which were lashed, bounced up, and the men were thrown a foot and an half perpendicularly up from the deck. Immediately after this, the ship sunk in the water as low as the main chains. The lead showed a great depth of water, and the line was tinged of a yellow colour and smelt of sulphur. The shock lasted about ten minutes, but they felt smaller ones for the space of 24 hours.

51
Of the
earthquakes
in Calabria
in 1783.

32
Sir Wil-
liam Ha-
milton's
account of
their ex-
tent.

33
General
account of
their ef-
fects.

Such were the phenomena of this very remarkable and destructive earthquake, which extended over a tract of at least four millions of square miles. The earthquakes, however, which in the year 1783 ruined a great part of Italy and Sicily, tho' much more confined in their extent, seem to have been not at all inferior in violence. Sir William Hamilton, who wrote a particular account of their effects, informs us, that "if, on a map of Italy, and with your compass on the scale of Italian miles you were to measure off 22, and then, fixing the central point in the city of Oppido (which seemed to be the spot where the earthquake had exerted its greatest force) form a circle (the radii of which will be 22 miles), you will then include all the towns, villages, &c. that have been utterly ruined, and the spots where the greatest mortality happened, and where there have been the most visible alterations on the face of the earth: then extend your compass on the same scale to 72 miles, preserving the same centre, and form another circle, you will include the whole country that has any mark of having been affected by the earthquake. A gradation was plainly observed in the damage done to the buildings, as also in the degree of mortality, in proportion as the countries were more or less distant from this supposed centre of the evil." Another circumstance was particularly remarked, and in which this earthquake differed very considerably from others, viz. that if two towns were situated at an equal distance from this centre, one on the hill, the other on the plain or in a bottom, the latter always suffered more by the shocks of the earthquakes than the former.

From the most authentic reports and accounts received by his Sicilian majesty's secretary of state, it was learned, that the part of Calabria which had been most affected by this heavy calamity, is that comprehended between the 38th and 39th degree of latitude: that the greatest force of the earthquake seemed to have exerted itself from the foot of those mountains of the Apennines called the Monte Dijo, Monte Sacro, and Monte Caulene, extending westward to the Tyrrhene sea: that the towns, villages, and farm-houses nearest these mountains, situated either on the hills or the plain, were totally ruined by the shock of the 5th of February about noon: that as the towns and villages were at a greater distance from this centre, the damage they received was less considerable; but that even these more distant towns had been greatly damaged by the subsequent shocks of the earthquakes, and effectually by those of the 7th, 26th, and 28th of February, and that of the

N^o 107.

1st of March; that from the first shock of the 5th of February, the earth had been in a continual tremor; and that the shocks were more sensibly felt at times in some parts of the afflicted provinces than at others; that the motion of the earth had been either whirling like a vortex, horizontal, or by pulsations, or by beatings from the bottom upwards. This variety of motions increased the apprehensions of the miserable inhabitants, who expected every moment that the earth would open under their feet, and swallow them up. It was said also that the rains had been continued and violent, frequently accompanied with irregular and furious gusts of wind; and that from all these causes, the face of that part of Calabria comprehended between the 38th and 39th degrees was entirely altered, particularly on the western side of the mountains above mentioned: that many openings and cracks had been made in those parts; some hills had been much lowered, and others entirely swallowed up; deep chasms had been made, by which many roads were rendered impassable; huge mountains were said to have been split asunder, and the parts of them driven to a considerable distance; deep valleys to have been filled up by the concurrence of the mountains which formed them before; the course of rivers altered; many springs of water dried up, and new ones formed in their place, &c. A singular phenomenon was said to have been observed at Laureana in Calabria Ultra; viz. that two whole tenements, with large plantations of olive and mulberry trees, situated in a valley perfectly level, had been detached by the earthquake, and transplanted, with the trees still remaining in their places, to the distance of about a mile from their first situations; and that from the spot on which they formerly stood, hot water had sprung up to a considerable height, mixed with sand of a ferruginous nature: that near this place also some countrymen and shepherds had been swallowed up, with their teams of oxen, and their flocks of goats and sheep. The number of lives lost was estimated at 32,367; but Sir William Hamilton is of opinion, that, including strangers, it could not be less than 40,000.

The fate of the inhabitants of Scilla was extremely affecting. On the first shock of the earthquake February 5th, they had fled along with their prince to the sea-shore, where they hoped for safety; but in the night-time a furious wave (said to have been boiling hot, and by which many people were alleged to have been scalded) overflowed the land for three miles, sweeping off in its return 2473 of the inhabitants, among whom was the prince himself, who were at that time either on the strand or in boats near the shore. But the most singular of all the phenomena enumerated in these accounts was, that a hill, about 500 palms in height, and 1300 in circumference at its basis, jumped to the distance of about four miles from the place where it formerly stood. At the same time the hill on which the town of Oppido stood, which extended about three miles, parted in two; and as its situation was between two rivers, both of these were of course stopped up; two great lakes were formed, and by their continual increase threatened to infect the air by their noxious exhalations.

Such were the accounts at first propagated and universally believed; but Sir William Hamilton, who made a tour through the ruined country that same year, found

Earth-
quake.

34
Fate of the
inhabitants
of Scilla.

35
A hill re-
moves from
its place.

36
Authenti-
city of these
accounts
examined
by Sir Wil-
liam Ha-
milton.

Earth-quake.

found that, though the effects in general were very dreadful, still there had been some exaggeration in several particulars. He set sail, for the purpose of making this tour, on the 2d of May, for Naples, and soon landed on the coast of Calabria Citra. The first appearances of the earthquake were observed at Cedraro; some of the principal inhabitants of that city having quitted their habitations, though Sir William could not perceive that any damage had been done. At St Lucido, the baron's palace and the church steeple had suffered, and most of the inhabitants were in barracks; but wishing to come as soon as possible to the centre of that scene of desolation, he set sail again, and landed on the 6th of May at the town of Pizzo in Calabria Ultra. This town is situated on a volcanic tufa, and had been greatly damaged by the earthquake of February 5th, but completely ruined by that of the 28th of March. Here he was assured, that the volcano of Stromboli, which is opposite, and in full view of the town, though distant about 50 miles, had smoked less and thrown up a smaller quantity of inflamed matter during the earthquakes than it had done for some years before; and that slight shocks still continued to be felt. Sir William had soon a convincing proof that this last information was true; for, sleeping that night in his boat, (called a *Maltese Speronara*), he was awakened with a smart shock, which seemed to lift up the bottom of the boat, but was not attended with any subterraneous noise.

From Pizzo he passed through a most beautiful country to Monteleone. This town, anciently called *Vibo Valentia*, is finely situated on a hill, overlooking the sea and the fine rich plains through which he had just passed; which are bounded by the Apennines, and crowned by Aspromonte the highest of them all. They were formerly interspersed with towns and villages; but at that time all of them lay in ruins. Monteleone suffered little on the 5th of February, but was greatly damaged on the 28th of March. Here every one agreed, that the shocks of the earthquake seemed to come with a rumbling noise from the westward; beginning usually with the horizontal motion, and ending with the vorticoſe, by which last the greatest part of the buildings in this province were destroyed. It was a general observation also, that before a shock the clouds seemed to be still and motionless, and that immediately after a heavy shower of rain a shock quickly followed. Here Sir William had an opportunity of seeing many people who had been thrown down by the violence of the shocks. Several peasants told him, that the motion of the earth was so violent, that the heads of the largest trees almost touched the ground from side to side; that during a shock, the horses and oxen extended their legs wide asunder, that they might not be thrown down; and that they gave evident signs of being sensible of the approach of each shock. "I myself (says he) have observed, that in those parts which have suffered most by earthquakes, the braying of an ass, the neighing of a horse, or the cackling of a goose, always drove people out of their barracks, and was the occasion of many Pater-nosters and Ave-marias being repeated, in expectation of a shock."

From Monteleone our author descended into the plain, having passed through many towns and villages

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which had been more or less ruined according to their vicinity to the plain. The town of Mileto, standing in a bottom, was totally ruined, not a house being left standing. At some distance he saw Soriano, and the noble Dominican convent, a heap of ruins. In this day's journey, he observes, that all habitations situated upon high grounds, the soil of which is a gritty sandstone, somewhat like a granite, but without the consistence, had suffered less than those situated on the plain; the latter being universally levelled with the ground. The soil of the plain is a sandy clay, white, red, and brown; but the white prevails most, and is full of marine shells, particularly scollops. It is intersected in many parts by rivers and torrents, which have produced wide and deep ravines all over the country. Passing through the ruined town of St Pietro, in his way to Rosarno, our author had a distant view of Sicily and the summit of Mount Etna, which then sent forth a considerable smoke. Just before his arrival at Rosarno, he passed over a swampy plain, in many parts of which he was shown small hollows in the earth, of the shape of an inverted cone. They were covered with sand, as was the soil near them. He was informed, that during the earthquake of the 5th of February, a fountain of water, mixed with sand, had been driven up from each of these spots to a considerable height. Here he spoke to a peasant who had been an eye-witness, and was even covered with the water and sand; but he assured him, that it was not hot, as had been represented. Before this appearance, he said, the river was dry; but soon after returned and overflowed its banks. He afterwards found, that the same phenomenon had been constant with respect to all other rivers in the plain, during the dreadful shock of the 5th of February. This phenomenon, our author thinks, may be easily explained by supposing the first impulse of the earthquake to have come from the bottom upwards, which all the inhabitants of the plain attested to be fact; the surface of the plain suddenly rising, the rivers, which are not deep, would naturally disappear, and the plain returning with violence to its former level, the rivers must naturally have returned and overflowed, as the sudden depression of the boggy grounds would as naturally force out the water that lay hid under their surface. It was observed in the other parts where this phenomenon had been exhibited, that the ground was always low and rushy. Between this place and Rosarno they passed the river Messano or Metauro (which is near the town above mentioned) on a strong timber-bridge, 700 palms long, lately built by the duke of Monteleone. From the cracks made in the banks and in the bed of the river by the earthquake, it was quite separated in one part; and the level on which the piers were placed having been variously altered, the bridge had taken an undulated form, so that the rail on each side was curiously scolloped; but the separated parts having been joined again, it was then passable. Our author was also informed, that at the time of the earthquake the river was perfectly dry for some seconds, and then returned with violence and overflowed; and that the bridge undulated in a most extraordinary manner. By the earthquake in the plain, our author understands the shock of the 5th of February, which did so much damage without giving any previous notice.

Earth-quake.

40
Less violent on the high grounds than on the plain.

37
Less smoke than usual emitted by Stromboli during the earthquakes.

38
Manner in which the shocks came at Monteleone.

39
Their excessive violence.

41
Conical openings made in the earth, which spouted up water during the shock.

42
Rivers dried up for a short time.

43
This phenomenon accounted for.

44
Appearance of a bridge on the Metauro.

M m

The

Earth-quake.

The town of Rosarno, with the duke of Monteleone's palace there, was entirely ruined; but the walls remained about six feet high, and were at that time fitting up as barracks. The only building that remained unhurt at Rosarno was the town gaol, in which were three notorious villains, who would probably have lost their lives if they had remained at liberty.

45
Explanation of the change of place of two tenements of land.

From Rosarno Sir William proceeded to Laureana, where he was conducted to the place where two tenements were said to have exchanged situations. This fact, which at the first relation appeared so incredible, Sir William assures us was true, and very easily accounted for. These tenements were situated in a valley surrounded by high grounds; and the surface of the earth, which was removed, had probably been undermined by little rivulets which come from the mountains, and were then plainly discernible on the bare spot which the tenements had quitted. Their course down the valley was sufficiently rapid to prove that it had not been a perfect level as was represented. The earthquake, he supposes, had opened some depositories of rain-water in the clay-hills which surround the valley; which water, mixed with the loose soil, taking its course suddenly through the undermined surface, lifting it up with the large olive and mulberry trees, and a thatched cottage, floated the whole piece of ground, with all its vegetation, about a mile down the valley, where it then stood with most of the trees erect. These two tenements were about a mile long

46
Cracks in the earth opened wide during the earthquake, and afterwards closed.

47
No hot water thrown up by the earth.

48
All the inhabitants of several towns buried in an instant in the ruins of their houses.

49
Houses of Casal Nuova lifted at once from their foundation.

and half a mile broad. In the neighbourhood were several cracks, none of them above a foot wide; but our author was assured, that during the earthquake they had opened wide, and swallowed up an ox with near 100 goats. In the above mentioned valley he saw the same sort of hollows in the form of inverted cones, out of which he had been assured that hot water mixed with sand issued during the earthquakes as at Rosarno; but, on proper inquiry, no person was found who could positively declare that the water had really been hot. Some of the sand which was thrown up had a ferruginous appearance, and seemed to have been acted upon by fire. It was said also, that, when fresh, this sand had the smell of sulphur; but this our author could not perceive.

Passing through the same beautiful country to the town of Polistene, he did not perceive a single house standing. "I travelled (says he) four days in the plain, in the midst of such misery as cannot be described. The force of the earthquake there was so great, that all the inhabitants of the towns were buried, alive or dead, in the ruins of their houses in an instant. The town of Polistene was large, but ill situated between two rivers that were subject to overflow. Two thousand one hundred, out of 6000, lost their lives here on the fatal 5th of February." At Casal Nuova, the prince's Gerace Grimaldi, with 4000 of her subjects, perished on the same day by the explosion; for such it appears to have been. Some who had been dug alive out of the ruins, told our author, that they had felt their houses fairly lifted up, without having the least previous notice. An inhabitant of Casal Nuova was at that moment on a hill overlooking the plain; when, feeling the shock, and turning round, instead of the town he saw only a thick cloud

of white dust like smoke, the natural effect of the crushing of the buildings and the mortar flying off.

The town of Casal Nuova was so effectually destroyed by this dreadful shock, that neither vestige of house or street remained, but all lay in one confused heap of ruins. Castillace and Milicusco, which our author next visited, were both in the same situation. Terra Nuova, situated in the same plain, stood between two rivers, which, with the torrents from the mountains, had, in the course of ages, cut deep and wide chasms in the soft sandy clay soil of which it is composed. At Terra Nuova the ravine or chasm is not less than 500 feet deep, and three quarters of a mile broad. Here the accounts of the earthquake were confused, by not having the situation of the place and nature of the soil explained. It was said, that a town had been thrown a mile from the place on which it stood, without mentioning a word of the ravine; that woods and corn-fields had been removed in the same manner, "when in truth (says our author) it was but upon a large scale, what we see every day upon a smaller; when pieces of the sides of hollow ways, having been undermined by rain waters, are detached by their own weight. Here, from the great depth of the ravine, and the violent motion of the earth, two huge portions of the latter, on which a great part of the town stood, which consisted of some hundred houses, had been detached into the ravine, and nearly across it, at about the distance of half a mile from the place where they formerly stood; and what is very extraordinary, many of the inhabitants who had taken this singular leap in their houses, were nevertheless dug out alive, and some unhurt." Our author's guide there, who was both a priest and physician, having been buried in the ruins of his house by the first shock, was blown out of it and delivered by the second, which immediately followed the first; and there were many well attested instances of the same thing having happened in different parts of Calabria. At Terra Nuova, however, only 400 out of 1600 inhabitants were left alive.

In other parts of the plain, situated near the ravine, and near the town of Terra Nuova, our author saw many acres of land, with trees and corn-fields, that had been detached into the ravine, frequently without having been overturned; so that the crops were growing as well as if they had been planted there. Other such pieces were lying in the bottom in an inclined situation; and others again that had been quite overturned. In one place, two of these immense pieces of land having been detached, opposite to one another, had filled the valley, and stopped the course of the river, the waters of which were forming a great lake; "and this (says our author) is the true state of what the accounts mention of mountains that had walked, and joined together, stopped the course of a river, and formed a lake."

At the moment of the earthquake the river disappeared as at Rosarno; and returning soon after, overflowed the bottom of the ravine about three feet in depth; so that the poor people who had been thrown with their houses into the ravine from the top of it, and had escaped with broken bones, were now in danger of being drowned. Our author was assured, that the water was salt like that of the sea; but this circumstance

Earth-quake.

50
Removal of part of the town of Terra Nuova explained.

51
Extraordinary escape of some of the inhabitants.

52
Great tracts of land moved from their places.

Earth-quake.

cumstance seemed to want confirmation. The same cause, however, given for the sudden disappearing of the river Metauro at Rosarno will account for the like phenomenon here, and in every part of the country where the rivers were dried up at the moment of the earthquake.

The whole town of Mollochi di Sotto was likewise detached into the ravine, and a vineyard of many acres lay near it in the bottom in perfect order, but in an inclined situation. There was a foot-path through this vineyard which had a singular effect in its then impracticable situation. Some water-mills which were on the river, being jammed between two such detached pieces as above described, were lifted up by them, and were then to be seen on an elevated situation many feet above the level of the river.

53
Water-mills raised up to an elevated situation.

54
Rising of the ground in some places, and sinking in others, explained.

55
Cracks in the earth, why generally formed near ravines.

56
Splitting of the mountain at Oppido explained.

57
A countryman detached with a great tract of land across a ravine.

58
Mountains and lakes formed by the earthquakes.

In several parts of the plain, the soil, with timber-trees and crops of corn, consisting of many acres, had sunk eight and ten feet below the level of the plain, and risen as many in other places. To explain this, it is necessary to remember, that the soil of the plain is a clay mixed with sand, which is easily moulded into any shape. In the plain, near the spots where the above mentioned pieces had been detached into the ravine, there were several parallel cracks; so that, had the violence of the earthquake continued, these pieces would also probably have followed. It was constantly remarked by our author, that near every ravine or hollow way, the parts of the plain adjoining were full of large parallel cracks. The earth rocking from side to side, and being supported only on one side, accounts very well for this circumstance.

From Terra Nuova our author continued his journey to Oppido. This city stands on a mountain of a ferruginous sort of gritty stone, unlike the clay soil of its neighbourhood; and is surrounded by two rivers in a ravine deeper and broader than that at Terra Nuova.

Instead of the mountain on which this city stands having split, as was reported, and by its fall stopped up the course of rivers, it was, as at Terra Nuova, huge pieces of the plain on the edge of the ravine, that had been detached into it, had nearly filled it up, and stopped the course of the rivers, the waters of which were then forming two great lakes. Part of the rock on which the city stood was indeed also detached, with several houses, into the ravine: "But that (says our author) is a trifling circumstance in comparison of the very great tracts of land with plantations of vines and olives which had been detached from one side of the ravine to the other, though the distance is more than half a mile. It is well attested, that a countryman, who was ploughing his field in this neighbourhood with a pair of oxen, was transported with his field and team clear, from one side of a ravine to the other, and that neither he nor his oxen were hurt.

"Having walked over the ruins of Oppido (says our author), I descended into the ravine, and examined carefully the whole of it. Here I saw indeed the wonderful force of the earthquake, which has produced exactly the same effects as those described in the ravine at Terra Nuova, but on a scale infinitely greater. The enormous masses of the plain, detached from each side of the ravine, lie sometimes in confused heaps, forming real mountains, and having stopped

the course of two rivers (one of which is very considerable), great lakes are already formed; and if not assisted by nature or art, so as to give the rivers their due course, must infallibly be the cause of a general infection in the neighbourhood. Sometimes I met with a detached piece of the surface of the plain (of many acres in extent) with the large oaks and olive-trees, with corn or lupins under them, growing as well and in as good order at the bottom of the ravine as their companions from whence they were separated do on their native soil, at least 500 feet higher, and at the distance of about three quarters of a mile. I met with whole vineyards in the same order in the bottom that had likewise taken the same journey. As the banks of the ravine from whence these pieces came are now bare and perpendicular, I perceived that the upper soil was a reddish earth, and the under one a sandy white clay, very compact, and like a soft stone. The impulse these huge masses received, either from the violent motion of the earth alone, or that assisted with the additional one of the volcanic exhalations set at liberty, seems to have acted with greater force on the lower and more compact stratum than on the upper cultivated crust: for I constantly observed, where these cultivated lands lay, the under stratum of compact clay had been driven some hundred yards farther, and lay in confused blocks; and, as I observed, many of these blocks were in a cubical form. The under soil, having had a greater impulse, and leaving the upper in its flight, naturally accounts for the order in which the trees, vineyards, and vegetation fell, and remain at present in the bottom of the ravine.

"In another part of the bottom of the ravine there is a mountain composed of the same clay soil, and which was probably a piece of the plain detached by an earthquake at some former period: it is about 250 feet high, and 400 feet diameter at its basis. This mountain, as is well attested, has travelled down the ravine near four miles; having been put in motion by the earthquake of the 5th of February. The abundance of rain which fell at that time, the great weight of the fresh detached pieces of the plain which I saw heaped up at the back of it, the nature of the soil of which it is composed, and particularly its situation on a declivity, accounts well for this phenomenon; whereas the reports which came to Naples of a mountain having leaped four miles, had rather the appearance of a miracle. I found some single timber-trees also with a lump of their native soil at their roots, standing upright in the bottom of the ravine, and which had been detached from the bottom of the plain above mentioned. I observed also, that many confused heaps of the loose soil, detached by the earthquake from the plains on each side of the ravine, had actually run like a volcanic lava (having probably been assisted by the heavy rain), and produced many effects much resembling those of lava during their course down a great part of the ravine. At Santa Cristina, near Oppido, the like phenomena have been exhibited, and the great force of the earthquake of the 5th of February seems to have been exerted on these parts, and at Casal Nuova, and Terra Nuova."

From Oppido Sir William proceeded to the town of Seminara and Palmi. The former, being situated higher

Earth-quake.

59
Observations on the soil of the detached tracts of land, and the effects of the shock upon them.

60
Removal of the hill accounted for.

61
Some parts of the soil run like a volcanic lava.

Earthquake.
62
Singular circumstance of a rivulet of oil by the breaking of the vessels in Palmi.

63
A shock with an explosion felt by Sir William Hamilton.

64
Fire issuing from the earth supposed to be electric.

higher up, had suffered less than Palmi which stood nearer the sea. Fourteen hundred lives were lost at this place, and some singular circumstances occurred. The town being a great market for oil, there were upwards of 4000 barrels of that liquid in it at the time of its destruction; so that by the breaking of these barrels and jars, a rivulet of oil ran from the ruins for many hours into the sea. Here our author was informed by the person who conducted him, that he had been buried in the ruins of his house by the first shock; and that after the second, which followed immediately, he found himself sitting astride a beam at least 15 feet high in the air. After Sir William's departure from Palmi, in going through one of the narrow passes among the mountains of Bagnara and Solano, he felt a very smart shock of an earthquake attended with a loud explosion like that of springing a mine; but fortunately it did not detach any rocks or trees from the high mountains which hung over their heads. In this country he was assured by several fishermen, that during the earthquake on the 5th of February, at night, the sea was hot, and that they saw fire issue from the earth in many parts. This last circumstance was frequently repeated in different parts of the plain, so that there seems to remain no doubt of its authenticity. The idea of Sir William Hamilton is, that "the exhalations which issued during the violent commotions of the earth were full of electrical fire; just as the smoke of volcanoes constantly is during violent eruptions: for I saw no mark (says he), in any part of my journey, of any volcanic matter having issued from the fissures of the earth; and I am convinced that the whole has been done by vapours and exhalations only. The first shock felt at this place, as I was assured, was lateral, and then vorticose, and exceedingly violent; but what they call violent here must have been nothing in comparison of what was felt in the plain of Casa Nuova, Polistene, Palmi, Terra Nuova, Oppido, &c. &c. where all agreed that the violence of the fatal shock of February was instantaneous, without warning, and from the bottom upwards."

65
Brute animals sensible of the approach of earthquakes.

At Reggio the shock had been much less violent than in the places hitherto visited by our author; and "though there was not a house in it inhabited or habitable, yet (says he) after having been several days in the plain, where every building is levelled with the ground, a house with a roof, or a church with a steeple, was to me a new and refreshing object." In this place he had an account from the archbishop of the earthquakes of 1770 and 1780, which obliged the inhabitants, in number 16,400, to encamp or remain in barracks for several months, without having done any considerable damage to the town. He was informed also, that all animals and birds are in a greater or lesser degree much more sensible of an approaching shock of an earthquake than any human being; but that geese, above all, seem to be the soonest and most alarmed at the approach of a shock: if in the water, they quit it immediately; and there are no means of driving them into it for some time after. The shock which damaged Reggio came on gently, so that the people had time to make their escape, and only 126 were killed; but in the plain this shock was as instantaneous as it was violent and destructive.

On the 14th of May, Sir William Hamilton having

taken leave of Reggio, set sail for Messina, which he visited next morning; and found that the shock, tho' very violent there, had been far inferior to what he had seen the effects of in other places. Many houses, even in the lower part of the town, were standing, and some little damaged; but in the upper and more elevated situations, the earthquakes seemed to have scarce had any effect. "A strong instance (says our author) of this is, that the convent of Santa Barbara, and that called the *Noviziato de Gesuiti*, both on an elevated situation, have not a crack in them; and that the clock of the latter has not been deranged in the least by the earthquakes, which have afflicted this country for four months past, and which still continue in some degree."

Notwithstanding this comparative mildness, however, the shock at Messina had been very terrible. All the beautiful front of the palazzate, which extended in very lofty uniform buildings, in the shape of a crescent, had been in some parts totally ruined, in others less; and there were cracks in the earth of the quay, a part of which had sunk above a foot below the level of the sea. These cracks were probably occasioned by the horizontal motion of the earth in the same manner as the pieces of the plain were detached into the ravines at Oppido and Terra Nuova; for the sea at the edge of the quay is so very deep, that the largest ships can lie along side. The earth, therefore, in its violent commotion, wanting support on that side next the sea, began to crack and separate; and as where there is one crack there are generally others less considerable in lines parallel to the first, our author supposes, that the great damage done to the houses nearest the quay was owing to such cracks below their foundations. It is said, that during the earthquake fire had been seen to issue from the cracks of the quay; but our author is persuaded that this, as in other cases, was only a vapour charged with electrical fire or a kind of inflammable air. Here also he was informed, that the shock of the 5th of February had been from the bottom upwards; but the subsequent ones generally horizontal or vorticose. A remarkable circumstance was observed at Messina, and through the whole coast of Calabria, which had been most affected by the earthquake, viz. that a small fish called *cicirelli*, resembling the English white bait, but larger, and which usually lie at the bottom of the sea buried in the sand, had, ever after the commencement of the earthquakes to the time this account was written, continued to be taken near the surface, and that in such abundance as to be common food for the poorest sort of people; whereas before the earthquakes this fish was rare, and reckoned among the greatest delicacies. Fish of all kinds also were taken in greater abundance on these coasts after the commencement of the earthquakes than before; which our author supposes to have been occasioned either by the volcanic matter having heated the bottom of the sea, or that the continual tremor of the earth had forced them out of their retreats. At Messina our author was likewise informed, that on the 5th of February, and for three days following, the sea about a quarter of a mile from the citadel rose and boiled in an extraordinary manner, and with a most horrid and alarming noise; the water in other parts of the strait being perfectly calm. "This

Earthquake.
66
Earthquake less violent at Messina than in Italy.

67
Effects of it there.

68
Remarkable circumstance respecting a kind of small fishes.

69
Extraordinary boiling of the sea near Messina.

(says

Earth-quake.

(says our author) seems to point out exhalations or eruptions from cracks at the bottom of the sea, which may very probably have happened during the violence of the earthquakes; all of which I am convinced have here a volcanic origin."

70
Account of the great wave which destroyed the inhabitants of Scilla.

The next inquiry made by this curious traveller was concerning the great wave which occasioned such destruction at Scilla, as has already been related. Having left Messina on the 17th of May, he proceeded in his boat to the entrance of the Faro, where he met with a priest who had been there on the night between the 5th and 6th of February, when the wave passed over that point of land. Here it carried off boats with 24 people, tore up trees by the roots, and left a considerable quantity of fish behind it. This priest had himself been covered by the wave, and with difficulty saved his life. He at first said the water was hot; but on being pressed with other questions, it amounted to no more than that the water was as warm as it usually is in summer. The wave, he said, rose to a great height, and came on with noise and such rapidity that it was impossible to escape.

71
The water was not hot as had been reported.

On crossing over to Scilla, Sir William was perfectly satisfied concerning the nature of this formidable wave, and found that the following was the true state of the fact: "The prince of Scilla having remarked, that during the first horrid shock, which happened about noon the 5th of February, part of a rock near Scilla had been detached into the sea; and fearing that the rock of Scilla, on which his town and castle are situated, might also be detached, he thought it safer to prepare boats, and retire to a little port or beach seated at the foot of it, and likewise surrounded by rocks. But the second shock of the earthquake about midnight, having detached a whole mountain much higher than that of Scilla, situated between the latter and Torre del Cavallo, it fell into the sea with such violence as to raise the fatal wave above mentioned. This having broken on the point of land called *Punto del Faro*, in the manner already related, instantly returned with great noise and celerity upon the beach, where the unfortunate prince and his subjects had taken refuge, and either dashed them with their boats and effects against the rocks, or whirled them into the sea. Those who had escaped the first and greatest wave, were carried off by a second and third less considerable, but which immediately followed the first. Our author spoke with many who had been involved in that wave, and violently hurt by it; but all of them agreed in asserting that the water was not hot.

73
Conjecture concerning a volcanic explosion in the bottom of the sea.

The earthquakes were not perfectly settled even in 1784, when Sir William Hamilton wrote the account of the state of Vesuvius, &c. to the Royal Society. In a postscript to that letter he adds the following confirmation of his conjecture, that the volcanic matter, which he supposed to have occasioned the earthquakes, had vented itself at the bottom of the sea betwixt Calabria and Sicily. "The pilot of one of his Sicilian majesty's sciabecques having some time after the earthquakes cast anchor off the point of Palizzi, where he had often anchored in 25 fathom water, found no bottom till he came to 65; and having sounded for two miles out at sea towards the point of Spartivento in Calabria, he still found the

same considerable alteration in the depth. The inhabitants of Palizzi likewise declare, that during the great earthquake on the 5th of February 1783, the sea had boiled and frothed up tremendously off their point."

Earth-quake.

74
To explain the phenomena of earthquakes, various hypotheses have been invented. Till lately, the hypotheses of modern philosophers were much the same with those of the ancients. Anaxagoras supposed the cause of earthquakes to be subterraneous clouds bursting out into lightning, which shook the vaults that confined them. Others imagined, that the arches, which had been weakened by continual subterraneous fires, at length fell in. Others derived these accidents from the rarefied steam of waters, heated by some neighbouring fires; and some, among whom was Epicurus, and several of the Peripatetic school, ascribed these terrible accidents to the ignition of certain inflammable exhalations.

Hypotheses concerning the cause of earthquakes.

This last hypothesis has been adopted by many of the most celebrated moderns, as Gassendus, Kircher, Schottus, Varenius, Des Cartes, Du Hamel, Honorius, Fabri, &c. The philosopher last mentioned indeed supposed, that waters prodigiously rarefied by heat might sometimes occasion earthquakes. The others supposed, as their hypothesis necessarily requires, that there are many and vast cavities underground which have a communication with one another: some of which abound with waters; others with vapours and exhalations, arising from inflammable substances, as nitre, bitumen, sulphur, &c. These combustible exhalations they supposed to be kindled by a subterraneous spark, or by some active flame gliding through a narrow fissure from without, or by the fermentation of some mixture; and when this happened, they must necessarily produce pulses, tremors, and ruptures at the surface, according to the number and diversity of the cavities, and the quantity and activity of the inflammable matter. This hypothesis is illustrated by a variety of experiments, such as mixtures of iron-filings and brimstone buried in the earth, gun-powder confined in pits, &c. by all which a shaking of the earth will be produced.

75
Dr Woodward suggests another hypothesis. He supposes that the subterraneous heat or fire, which is continually elevating water out of the abyss, which, according to him, occupies the centre of the earth, to furnish rain, dew, springs, and rivers, may be stopped in some particular part. When this obstruction happens, the heat causes a great swelling and commotion in the waters of the abyss; and at the same time, making the like effort against the superincumbent earth, that agitation and concussion of it is occasioned which we call an earthquake.

Hypothesis of Dr Woodward.

76
Mr Amontons of the Royal Academy of Sciences suggests an hypothesis entirely different from any of the above mentioned ones. According to the received philosophical principles, which suppose the atmosphere to be about 45 miles high, and that the density of the air increases in proportion to the absolute height of the superincumbent column of fluid; it is shown, that at the depth of 43,528 fathoms below the surface of the earth, air is but one-fourth lighter than mercury. Now, this depth of 43,528 fathoms is only

Of Mr Amontons.

Earth-
quake.

only a 74th part of the semidiameter of the earth; and the vast sphere beyond this depth, in diameter 6,451,538 fathoms, may probably be only filled with air; which will be here greatly condensed, and much heavier than the heaviest bodies we know of in nature. But it is found by experiment, that the more air is compressed, the more does the same degree of heat increase its spring, and the more capable does it render it of a violent effect; and that, for instance, the degree of heat of boiling water increases the spring of the air above what it has in its natural state, in our climate, by a quantity equal to a third of the weight wherewith it is pressed. Whence we may conclude, that a degree of heat, which on the surface of the earth will only have a moderate effect, may be capable of a very violent one below. And as we are assured, that there are in nature degrees of heat much more considerable than that of boiling water, it is very possible there may be some, whose violence, further assisted by the exceeding weight of the air, may be more than sufficient to break and overturn this solid orb of 43,528 fathoms; whose weight, compared to that of the included air, would be but a trifle.

77
All these
hypotheses
rejected by
Dr Stuke-
ly.

Though none of these hypotheses were sufficient for explaining the phenomena of earthquakes in a satisfactory manner, one or other of them continued to be adopted by almost all philosophers till the year 1749. In the month of March that year, an earthquake was felt at London and several other places in Britain. Dr Stukely, who had been much engaged in electrical experiments, began to suspect that phenomena of this kind ought to be attributed not to vapours or fermentations generated in the bowels of the earth, but to electricity. In a paper published by him on this subject, he rejects all the above mentioned hypotheses for the following reasons.

1. That there is no evidence of any remarkable cavernous structure of the earth; but that, on the contrary, there is rather reason to presume that it is in a great measure solid, so as to leave little room for internal changes and fermentations within its substance; nor do coal-pits, he says, when on fire, ever produce any thing resembling an earthquake.

2. In the earthquake at London, in March 1749, there was no such thing as fire, vapour, smoke, smell, or an eruption of any kind observed, though the shock affected a circuit of 30 miles in diameter. This consideration alone of the extent of surface shaken by an earthquake, he thought sufficient to overthrow the supposition of its being owing to the expansion of any subterraneous vapours. For as small fire-balls bursting in the air propagate a sulphureous smell to the distance of several miles, it cannot be supposed, that so immense a force acting instantaneously on that compass of ground should never break the surface of it, nor become discoverable either to the sight or the smell: besides, that the operation of such a fermentation would be many days in continuance, and the evaporation of so much inflammable matter would require a long space of time. That such an effect, therefore, should be produced instantaneously, can be accounted for by electricity only; which acknowledges no sensible transition of time, no bounds.

3. If vapours and subterraneous fermentations, ex-

plosions and eruptions, were the cause of earthquakes, they would absolutely ruin the whole system of springs and fountains, wherever they had once been; which is contrary to fact, even when they have been frequently repeated. Even in the earthquake in Asia Minor, A. D. 17, which destroyed 13 great cities, and shook a mass of earth 300 miles in diameter, nothing suffered but the cities; neither the springs nor the face of the country being injured, which indeed remains the same to this day.

4. That any subterraneous power sufficient to move 30 miles in diameter, as in the earthquake which happened at London, must be lodged at least 15 or 20 miles below the surface; and therefore must move an inverted cone of solid earth, the base of which is 30 miles in diameter, and the axis 15 or 20; an effect impossible to any natural power whatever, except electricity. So in Asia Minor, such a cone must have been 300 miles in the diameter of the base, and 200 in the axis; which not all the gun-powder that has been made since the invention of it, much less any vapours generated so far below the surface, could possibly effect.

5. A subterraneous explosion will not account for the manner in which ships, far from land, are affected during an earthquake; which seem as if they struck upon a rock, or as if something thumped against their bottoms. Even the fishes are affected. A subterraneous explosion would only produce a gradual swell, and not give so quick an impulse to the water as would make it feel like a stone.

From comparing these circumstances, the Doctor says, he had always thought that an earthquake was a shock of the same kind as those which commonly occur in electrical experiments. And this hypothesis was confirmed by the phenomena attending earthquakes; particularly those of 1749 and 1750, which gave rise to his publication.

The weather, for five or six months before, had been uncommonly warm; the wind south and south-west, without rain; so that the earth must have been in a state peculiarly ready for an electrical shock. The flat country of Lincolnshire had been under an exceeding great drought. The uncommonness of the first of these circumstances, he remarks, is the reason why earthquakes are less frequently experienced in the northern than in the southern regions of the world, where the warmth and dryness of the air, so necessary to electricity, are more usual: And the latter shows how fit the dry surface was for an electrical vibration; and (which is of great importance) that earthquakes reach but little below the surface of the earth.

Before the earthquake at London, all vegetables had been uncommonly forward. And electricity is well known to quicken vegetation. The aurora borealis had been frequent about that time; and just before the earthquake, had been twice repeated in such colours as had never been seen before. It had also removed southerly, contrary to what is common in England; so that the Italians, and those among whom earthquakes were frequent, actually foretold the earthquake. The year had been remarkable for fire-balls, lightning, and coruscations; and these are rightly judged to be meteors of an electrical nature.

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quake.

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His method
of account-
ing for
earth-
quakes.

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quake.

In these circumstances of the earth and air, nothing, he says, is wanting to produce an earthquake, but the touch of some non-electric body; which must necessarily be had *ab extra* from the region of the air or atmosphere. Hence he infers, that if a non-electric cloud discharge its contents upon any part of the earth, in that highly electrical state, an earthquake must necessarily ensue. As the discharge from an excited tube produces a commotion in the human body, so the discharge of electric matter from the compass of many miles of solid earth must needs be an earthquake; and the snap from the contact, the horrid uncouth noise attending it.

The Doctor had been informed by those who were up and abroad the night preceding the earthquake, and early in the morning, that convulsions in the air were extremely frequent; and that a little before the earthquake, a large and black cloud suddenly covered the atmosphere, which probably occasioned the shock by the discharge of a shower.

A sound was observed to roll from the Thames towards Temple Bar before the houses ceased to nod, just as the electrical snap precedes the shock. This noise (which generally precedes earthquakes) the Doctor thought could be accounted for only on electrical principles: for, in a subterraneous eruption, the direct contrary would happen.

The flames and sulphureous smells, which are sometimes observed in earthquakes, might, he thought, be more easily accounted for, on the supposition of their being electrical phenomena, than from their being occasioned by eruptions from the bowels of the earth. So also the suddenness and expedition of the concussion, it being felt at the same instant over such a large surface, and the little damage also which earthquakes generally occasion; sufficiently point out what sort of a motion it is: not a convulsion of the bowels of the earth; but an uniform vibration along its surface, like that of a musical string, or a glass when rubbed on the edge with one's finger.

The circumstance of earthquakes chiefly affecting the sea-coast, places along rivers (and, adds Doctor Priestley, eminences), is a farther argument of their being electrical phenomena. This is illustrated by a particular account of the direction in which the earthquake was conveyed.

The last argument he uses is taken from the effects which it had on persons of weak constitutions, who were, for a day or two after it happened, troubled with pains in the back, rheumatisms, hysterics, and nervous disorders; just in the same manner as they would have been after an actual electrification: to some these disorders proved fatal.

As to the manner in which the earth and atmosphere are put into this state, which prepares them to receive such a shock, and whence the electric matter comes, the Doctor does not pretend to determine; but thinks it as difficult to be accounted for as magnetism, gravitation, and many other secrets of nature.

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Hypothesis
of S. Beccaria;

The same hypothesis was advanced by Signior Beccaria, without knowing any thing of Dr Stukeley's discoveries. But this learned Italian imagined the electric matter which occasions earthquakes to be

lodged deep in the bowels of the earth, agreeably to his hypothesis concerning lightning.

Now, as it appears that the quantity of electric matter in the simplest thunder-storms is so inconceivably great, that it is impossible to be contained by any cloud or number of clouds; and as, during the progress of a thunder-storm which he observed, though the lightning frequently struck to the earth, the same clouds were the next moment ready to make a still greater discharge; it was evident, that they must have received at one place, the moment a discharge was made from them in another. Let us suppose these clouds ever so great, if the lightning proceeded only from them, the quantity must be lessened by every discharge; and no recruits that any new clouds might bring can bear any proportion to the discharge which must ensue from the collision of so great a number as combine to form a thunder-storm. It seems therefore most likely, that the electric matter is continually darting from the clouds in one place, at the same time that it is discharged from the earth in another; and, consequently, that the clouds serve as conductors to convey the electric fluid from those places of the earth which are overloaded with it, to those which are exhausted.

This theory being admitted, there will, he thinks, be little difficulty in attributing earthquakes to the same cause. For if the equilibrium of the electric matter be by any means lost in the bowels of the earth; so that the best method of restoring it shall be by the fluid bursting into the air, and traversing several miles of the atmosphere, to come at the place where it is wanted; it may be easily imagined, that violent concussions will be given to the earth by the sudden passage of so powerful an agent. This, in his opinion, was confirmed by the flashes of light, exactly resembling lightning, which have been frequently seen to rush from the top of Mount Vesuvius, at the time that ashes and other light matters have been carried out of it into the air, and dispersed uniformly over a large tract of country. And it is well known, that volcanoes have a near connection with earthquakes.

A rumbling noise like thunder, and flashes of light rising from the ground, have been generally observed to attend earthquakes. And lightning itself has been known to be attended with small shakings of the earth. So also *ignes fatui*, in mines, he looked upon as an argument that the electric fluid was sometimes collected in the bowels of the earth.

Dr Priestley, in his History of Electricity, observes upon these theories, that a more probable hypothesis may perhaps be formed out of both of them. "Suppose (says he) the electric matter to be, some way or other, accumulated on one part of the surface of the earth, and on account of the dryness of the season not easily to diffuse itself; it may, as Signior Beccaria supposes, force its way into the higher regions of the air, forming clouds in its passage out of the vapours which float in the atmosphere, and occasion a sudden shower, which may further promote the passage of the fluid. The whole surface, thus unloaded, will receive a concussion, like any other conducting substance, on parting with, or receiving a quantity of the electric fluid. The rushing noise will likewise sweep over the whole.

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quake.

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Of Dr
Priestley.

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whole extent of the country. And upon this supposition also, the fluid, in its discharge from the country, will naturally follow the course of the rivers, and also take the advantage of any eminences to facilitate its ascent into the higher regions of the air."

The Doctor, making experiments with a battery on the passage of the electrical fluid over different conducting substances, and, among these, over water;—and remarking a resemblance between its passage over the surface of the water, and that which Dr Stukeley supposed to sweep the surface of the earth, when a considerable quantity of it is discharged to the clouds during an earthquake; immediately suspected that the water over which it passed, and which was visibly thrown into a tremulous motion, must receive a concussion resembling that which is given to the waves of the sea on such an occasion.

To try this, he himself and others present put their hands into the water at the time that the electrical flash passed over its surface; and they felt a sudden concussion given to them, exactly like that which is supposed to affect ships at sea during an earthquake. This percussion was felt in various parts of the water, but was strongest near the place where the explosion was made. The same experiment, with a little variation, being afterwards made with a single jar, at some distance below the surface of the water, produced the like effect, though in a weaker degree. "This similarity in the effect (the Doctor observes) is a considerable evidence of a similarity in the cause.

"Pleased with this resemblance of the earthquake (says he), I endeavoured to imitate that great natural phenomenon in other respects: and it being frosty weather, I took a plate of ice, and placed two sticks about three inches high on their ends, so that they would just stand with ease; and upon another part of the ice I placed a bottle, from the cork of which was suspended a brass ball with a fine thread. Then, making the electrical flash pass over the surface of the ice, which it did with a very loud report, the nearer pillar fell down, while the more remote stood; and the ball which had hung nearly still, immediately began to make vibrations about an inch in length, and nearly in a right line from the place of the flash.

"I afterwards diversified this apparatus, erecting more pillars, and suspending more pendulums, &c. sometimes upon bladders stretched on the mouth of open vessels, and at other times on wet boards swimming in a vessel of water. This last method seemed to answer the best of any: for the board representing the earth, and the water the sea, the phenomena of them both during an earthquake may be imitated at the same time; pillars, &c. being erected on the board, and the electric flash being made to pass either over the board, over the water, or over them both."

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Deficiency
of all these
hypotheses. These three hypotheses concerning the cause of earthquakes, though somewhat differing from one another, yet agree in the main; but if a particular solution of the phenomena is required, every one of them will be found deficient.

If, according to Dr Stukeley's hypothesis, the electric matter is lodged only on the surface of the earth, or but at a small depth below, how are we to account for those violent effects which often take place in the bowels of the earth? In the earthquake at Lisbon, a

N^o 107.

large quay sunk to an unfathomable depth. We are certain that the cause of the earthquake must have been below this depth, however great it was, and have opened the earth for an immense way downwards. At the same time an hill in Barbary clave asunder, and the two halves of it fell different ways. This shows, that the cause of the earthquake operated not on the surface of the hill, but on the solid foundation and contents of it; nor can it be explained by any superficial action whatever. From what the miners at Eyam bridge in Derbyshire observed, it is also evident, that the shock was felt at the depth of 396 feet below the surface of the ground more than at the surface itself; and consequently there is all the reason in the world to think that the cause lay at a depth vastly greater.

Again, though the earthquake at London was supposed to begin with a black cloud and shower; yet in that of 1755, the effects of which were incomparably greater, the air was calm and serene almost in every place where it was felt. It doth not appear that there is at any time a considerable difference between the electricity of the atmosphere and that of the earth, or indeed that there can be so. For if the earth is electrified *plus* and the atmosphere *minus*, there are innumerable points on the surface of the earth which must be imperceptibly drawing off the superfluous electric matter into the air. The vapours also, with which the atmosphere abounds, would always be ready in the same service; and thus thunder and lightning might indeed sometimes be produced, but not earthquakes. But lastly, neither the air nor the earth does always show any remarkable signs of electricity before earthquakes happen. For, the summer before the earthquake at Manchester in 1777, there had scarce been any thunder, lightning, or other signs of electricity in the atmosphere, and vegetation had been extremely backward; and, according to the best accounts, the weather continued remarkably fine.

For these reasons, Dr Stukeley's hypothesis seems not to be satisfactory. That of Signior Beccaria is not indeed liable to the above mentioned objections; but seems highly improbable on another account. The atmosphere is known to be a substance through which the electric matter makes its way with the utmost difficulty. It is a vastly worse conductor than water or than moist earth. If therefore the equilibrium of this fluid is lost in the bowels of the earth, it is impossible to give a reason why it should not rather go to the places where it is wanted through the earth itself, than through the atmosphere. Besides, if this was the case, the shock of an earthquake could only be felt at those places where the electric fluid issued from the earth, and where it entered. All the intermediate places ought to be free from any shock, and to be sensible only of a violent concussion in the atmosphere; but of this we have no example in any history of earthquakes whatever.

Dr Priestley's hypothesis is liable to the same objections with that of Dr Stukeley; for any superficial operation will never account for those effects above mentioned, which take place at great depths below the surface. His experiment cannot be admitted as any way conclusive with regard to the cause of earthquakes, because no quantity of electric fire is seen to pass over the

Earth-
quake.

Earth-
quake.

the earth and sea, like the flash attending the explosion of an electric battery; and the force of his earthquake (being but just able to throw down a stick that could hardly stand by itself) seems by far too little. The utmost force of electricity which man can raise, is indeed very trifling, when compared with the great operations of nature: but it is certain, that the force of an electric battery is by no means contemptible; and was its whole power to be employed in producing an imitation of an earthquake, it certainly would do much more than throw down a small stick. The bad success of this experiment therefore shows, that the Doctor's theory is erroneous: for almost the whole of his electric power was spent another way; and we cannot suppose that any considerable part of the force which produces earthquakes is spent any other way than in the very production of the earthquake itself.

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Principles
on which
the pheno-
mena may
be explain-
ed.

* See Elec-
tricity.

If it is attempted to give an explanation of the phenomena of earthquakes, which shall be free from the objections above mentioned, and from all others, it will be necessary, in the first place, to consider those parts of the system of nature which seem to be most affected during the terrible phenomena we treat of. These parts are, the air, the solid earth, and the water. Of these the two former are electrics *per se*; the latter is a conductor, though a bad one *. Hence it follows,

1. That in proportion to the quantity of earth which is mixed with any quantity of water, that mixture will approach nearer to the nature of an electric *per se*, and *vice versa*.

2. It also follows, that whatever quantity of electricity is communicated to the solid earth, will be quickly taken off from it by the water which is mixed with it, in the same manner that the electric matter is carried off from an excited globe by a metallic conductor.

3. The whole earth is moist, and therefore in some degree a conductor. Nevertheless, as earth of all kinds, when perfectly dry, is found to be an electric capable of receiving a charge like glass, it is therefore possible, that the electric power of the earth may be excited to such a degree, that the moisture of the solid parts cannot easily contain the quantity of electricity communicated.

4. In this case, the earth must either give undoubted signs of its being excited in the same manner that other excited electrics do, or the electricity must be discharged somewhere else.

5. To receive any superfluous quantity of electric matter that may be communicated to the solid earth, the waters of the ocean are always ready. These, being a much better conductor than earth, must be a principal mean of preserving the equilibrium of electricity in the different parts of the earth; and hence we see a natural reason why the waters of the ocean should cover so large a proportion of the globe as they are known to do. See OCEAN.

6. It is known, that fire is also a conductor of electricity. Therefore, wherever a quantity of electric matter is collected in any part of the solid earth, if it can neither be conveniently received by the moisture which the earth naturally contains, nor by the ocean in its neighbourhood, it will discharge itself by any volcano that happens to be in an active state, near the place where that collection of electric matter is.

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7. It is also found, that the electric fluid, being violently resisted by the superincumbent atmosphere, hath always a tendency to discharge itself in those places where that resistance is least. The tops of high mountains, therefore, where the weight of the atmosphere is greatly diminished, will also afford a ready passage for the electric fluid when it is collected in very great quantity in the bowels of the earth.

8. If, from some natural causes, the electric matter shall happen to be collected in the bowels of the earth in any particular place, and at the same time such obstacles are thrown in its way, that it can neither discharge itself into the ocean, nor into the atmosphere by the tops of high mountains, nor by the more open passages of volcanoes; the most terrible consequences must ensue: the matter being pent up, and the cause by which it is collected continuing still to act, its impulse becomes at last irresistible. It then flies against every obstacle with inconceivable violence. It breaks out in all those places where there is the least resistance, and therefore the shock is directed a great number of different ways at once. Houses, steeples, trees, &c. by their height take off somewhat of the pressure of the atmosphere; and therefore the electric matter flies against them very violently. The houses and other buildings being bad conductors, are thrown down; the trees affording a readier passage to the fluid are not hurt, though even they also are sometimes split. The height of the mountains renders them the objects of the destructive force of this fluid much more than any buildings whatever. Hence they are often rent, and rocks thrown down from them. The water contained in the solid parts of the earth, being a conductor of electricity, becomes overloaded with it; and when it can receive no more, is forced to yield to the impulse of the rest, and therefore is thrown out of the earth in great quantities. For the same reason, the waters on the surface of the earth are most violently agitated. The small quantities contained in wells are thrown out at the tops of them: The rivers and lakes, which contain too great a quantity of water to be thrown off from the earth, rise in billows: The ocean itself, receiving more electric matter than can be immediately dispersed through the whole body of water, or evaporate into the atmosphere, retreats from the land, and is raised in vast mountains. The solid earth, being unable either to conduct the fluid quietly to those parts where it is wanted, or to retain it, is violently shaken or rent in multitudes of places; and this not only on the surface, but to great depths. The electricity being now in some measure discharged from the earth, the ocean rushes forward with fury to discharge in its turn the excess of electric matter it just before received from the earth. If there are volcanoes in the neighbourhood, the violent discharge of electricity is sure to manifest itself by setting them in a flame; and thus, till the equilibrium is restored, all nature seems to be threatened with dissolution.—Even in those places where the force of the electric fluid is not able to shake the solid parts of the earth, it manifests its power by agitating the waters in the manner above described. Water being a much better conductor of electricity than earth, this subtle fluid, as soon as it can get out from the solid earth, flies to the water. The consequence is, that the water immediately swells up, and

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quake.

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is attracted by whatever part of the earth has less electricity than itself. Hence those strange irregular motions of the waters in different places, so particularly observed at the time of the earthquake at Lisbon; and which it seems impossible to account for from any other cause than an immediate discharge of electric matter from the earth into them.

9. As it is impossible that any part of the earth can be electrified without communicating a proportionable share of electricity to the animals that live upon it, and have a constant communication with it, it thence follows, that there can be no considerable commotion in the electric matter lodged in the bowels of the earth, without affecting that which is contained in the bodies of the animals. Hence the brutes, who seem to be more sensible of such commotions than we, run about, and show signs of fear, before the earthquake comes on; and hence the giddiness, sickness, &c. which the human race are subject to during the time of the shock, even though they do not feel it, as was the case at Gibraltar.

10. As the atmosphere hath a communication with the earth, it is scarce to be supposed that the earth can, for any length of time, contain a considerable quantity of electric matter, without communicating to the atmosphere a proportionable quantity. Before an earthquake, therefore, we must suppose the electricity of the earth and air to be in perfect equilibrio. Hence the weather is serene, there is no wind, nor any other sign in the atmosphere, of the terrible catastrophe that is about to ensue. But the moment the discharge is made from the earth, the equilibrium between the terrestrial and atmospherical electricity is broken; the air either begins to receive the fluid from the earth, or the earth from the air. As there is not then time for the collection of thunder-clouds by which the electricity may be brought down in sudden flashes of lightning, the fluid breaks through the substance of the air itself with dismal and horrid noises, which always accompany an earthquake. That this is the case, seems highly probable from an experiment of M. de Romas, when, having brought down a vast quantity of electric matter from the clouds by means of a kite, he heard the noise it made in the air, like the continual blowing of a small forge bellows. In general, a considerable change of weather takes place at the time of an earthquake, though not always. In the earthquake which happened in England in 1777, there was no remarkable change of weather there; but, soon after, there was a great deal of thunder and lightning in the southern parts of Scotland: which seems to indicate, that the electric fluid discharged from the earth in England had taken its course northward, and produced the phenomena before mentioned in Scotland. The same observation may likewise be made with regard to 1789, when there were slight shocks of an earthquake both in England and Scotland. That in England being the first, was followed by an uncommon frequency of thunder and lightning in the southern parts of Scotland; by reason of the progress of the electric matter northward after it was discharged into the atmosphere: but the shocks which happened in the northern part of Scotland (*viz.* about Crief in Stirlingshire) were not followed by any thunder to the southward; because the electric matter, though dis-

charged into the atmosphere, cannot return to the south without first going north, and rising up into the higher regions.

In the earthquakes in Calabria, in the year 1783, there were some circumstances which seem to militate against the theory just now laid down. The most remarkable of these is their attacking the places situated on the plain much more than those which stood on the higher grounds. This is particularly insisted upon by Sir William Hamilton. "If two towns (says he) were situated at an equal distance from the centre (of the force of the earthquake), the one on a hill, the other on the plain or in a bottom, the latter always suffered greatly more from the shocks of the earthquake than the former; a sufficient proof to me of the cause coming from beneath, as this must naturally have been productive of such an effect. And I have reason to believe, that the bottom of the sea, being still nearer the volcanic cause, would be found, if it could be seen, to have suffered still more than the plain itself: but the philosophers, who do not easily abandon their ancient systems, make the present earthquakes to proceed from the high mountains of the Apennines that divide Calabria Ultra, such as the Monte Dejo, Monte Caulone, and Aspramonte. I would ask them this simple question, Did the Eolian or Lipari islands (all which rose undoubtedly from the bottom of the sea by volcanic explosions, at different and perhaps very distant periods) owe their birth to the Apennines in Calabria, or to veins of minerals in the bowels of the earth and under the bottom of the sea? Stromboli, an active volcano, and probably the youngest of those islands, is not above 50 miles from those parts of Calabria that have suffered most by the late earthquakes. The vertical shocks, or, in other words, those whose impulse was from the bottom upwards, have been the most destructive to the unhappy towns in the plain. Did they proceed from Monte Dejo, Monte Caulone, or Aspramonte? In short, the idea I have of the present local earthquakes is, that they have been caused by the same kind of matter that gave birth to the Eolian islands; that perhaps an opening may have been made at the bottom of the sea, and most probably between Stromboli and Calabria Ultra; for from that quarter all agree that the subterraneous noises seem to have proceeded; and that the foundation of a new island or volcano may have been laid, though it may be ages, which to nature are but moments, before it is completed and appears above the surface of the sea. Perhaps, too, the whole destruction I have been describing may have proceeded simply from the exhalations of confined vapours generated by the fermentation of such minerals as produce volcanoes, which have escaped where they meet with the least resistance, and must naturally, in a greater degree, have affected the plain than the high and solid grounds around it."

In a memoir on this earthquake by M. Dolomieu, that author endeavours to exclude electricity from having any share in the matter. "The sea (says he), during the earthquakes of 1783, had little share in the shocks of the main land. The mass of water experienced no general movement of fluctuation or oscillation; the waves did not rise above their ordinary limits. Those which, on the night of the 5th of February, beat against the coast of Scilla, and which afterwards

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quake.

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Circumstances in the earthquakes of 1783 seem- ingly oppo- site to this theory.

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This earth-quake less violent among the Apennine mountains than elsewhere.

85

Sir William Hamilton's opinion of the cause.

86

Electricity denied by M. Dolomieu to have any share in the production of earthquakes.

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quake.

terwards covered the point of the Faro of Messina, were only the effects of a particular cause. The fall of a mountain into the sea raised the waters, which received an undulating motion, as happens always in similar cases. The undulation reached from the point of Sicily beyond the Cape of Rosacorno, extending in length along the coast which runs to the south; but always with a decrease in elevation as it was more remote from Sicily. Whatever inquiries the author has made, he has not been able to discover, in all the details which have been given him, any proofs of the existence of electrical phenomena: no spark, no disengagement of the electrical fluid, which the Neapolitan naturalists wish to assign as the cause of earthquakes.

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Of the state
of the at-
mosphere.

"The state of the atmosphere was not the same in the whole range of earthquakes. While the tempests and the rain seemed to have conspired with them for the destruction of Messina, the interior part of Calabria enjoyed very fine weather. A little rain fell in the plain in the morning of the 5th of February; but the sky was clear during the rest of the day. This month and that of March were not only pretty serene, but likewise warm. There were some storms and rain; but they were the natural attendants of the season.

"The moving force seems to have resided under Calabria itself, since the sea which surrounds it had no share in the oscillations or vibrations of the continent. This force seems also to have advanced along the ridge of the Apennines in ascending from the south to the north. But what power in nature is capable of producing such effects? I exclude electricity, which cannot accumulate continually during the course of a year, in a country surrounded with water, where every thing conspires to place this fluid in equilibrio. Fire remains to be considered. This element, by acting directly upon the solids, can only dilate them; then their expansion is progressive, and cannot produce violent and instantaneous movements. When fire acts upon fluids, such as air and water, it gives them an astonishing expansion; and we know that then their elastic force is capable of overcoming the greatest resistances. These appear the only means which nature could employ to operate the effects we speak of; but in all Calabria there is no vestige of a volcano; nothing to point out any interior combustion; no fire concealed in the centre of mountains, or under their base; a fire which could not exist without some external signs. The vapours dilated, the air rarefied by a heat constantly active, must have escaped through some of the crevices or clefts formed in the soil; they must there have formed currents. Both flame and smoke must have issued by some one or other of these passages. These once opened, the pressure would have ceased; the force not meeting with any more resistance, would have lost its effect; and the earthquakes could have no longer continued. None of these phenomena took place: we must then renounce the supposition of a combustion acting directly under Calabria. Let us see if having recourse to a fire at some distance from this province, and acting upon it only as an occasional cause, we shall be able to explain all the phenomena which have accompanied the shocks. Let us take for example *Ætna* in Sicily, and suppose large cavities under the mountains of Calabria; a supposition which cannot be refused. It is cer-

tain that immense subterraneous cavities do exist, since *Ætna*, in elevating itself by the accumulation of its explosions, must leave in the heart of the earth cavities proportioned to the greatness of the mass.

"The autumn of 1782 and the winter of 1783 were very rainy. The interior waters, augmented by those of the surface, may have run into those caverns which form the focus of *Ætna*: there they must have been converted into vapour capable of the highest degree of expansion, and must have pressed forcibly against every thing which opposed their dilatation. If they found canals to conduct them into the cavities of Calabria, they could not fail to occasion there all the calamities of which I have given the description.

"If the first cavity is separated from the second by a wall (so to speak) or some slight division, and this separation is broken down by the force of the elastic vapour, the whole force will act against the bottom and sides of the second. The focus of the shocks will appear to have changed place, and become weaker in the space which was agitated most violently by the first earthquake.

"The plain, which was undoubtedly the most slender part of the vault, yielded most easily. The city of Messina, placed upon low ground, experienced a shock which the buildings on higher grounds did not. The moving force ceased at once as suddenly as it acted violently. When, at the periods of the 7th of February and the 28th of March, the focus appeared changed, the plain scarce suffered any thing. The subterraneous noise, which preceded and accompanied the shocks, appeared always to come from the southwest, in the direction of Messina. It seemed like thunder under ground, which resounded beneath vaults.

"If *Ætna*, then, has been the occasional cause of the earthquakes, it has also prepared, for some time, the misfortunes of Calabria, by gradually opening a passage along the coast of Sicily to the foot of the Neptunian mountains: for during the earthquakes of 1780, which disturbed Messina the whole summer, they felt, the whole length of that coast, from Taormina even to the Faro, considerable shocks; but near the village of Alli and Fiume de Nisi, which are situated about the middle of that line, shocks so violent were experienced, that they dreaded lest the mouth of a volcano should open. Each shock resembled the effort of a mine that had not strength to make an explosion. It appears, that then the volcano opened a free passage for the expansion of its vapours, and that they have since circulated without restraint; since in the year 1783 the earthquake was almost nothing upon that part of Sicily, at the time that Messina buried under its ruins the half of its inhabitants."

On this theory it is first to be observed, that there is a considerable disagreement in points of fact between M. Dolomieu and Sir William Hamilton. The former could find no account of any spark or other electrical phenomenon; the latter, on the contrary, was assured that flames had often been seen to issue from the earth; and these he expressly attributes to a vapour charged with electrical fire. M. Dolomieu takes little notice of the rains that fell; while Sir William Hamilton attributes to them several of those disruptions of the earth, which, without them, would have seemed very extraordinary. The latter likewise informs

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quake.

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Whence a
supply of
water suf-
ficient to
produce
such effects
might be
derived.

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Subterra-
neous fire
supposed
to be the
cause.

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Disagree-
ment with
regard to
facts be-
twixt M.
Dolomieu
and Sir
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Proofs of electricity being concerned.92
M. Dolomieu's hypothesis insufficient.93
Of the fore-knowledge which brute animals had of the shock.94
Erroneous method of arguing pursued by M. Dolomieu.95
The earthquakes could not be occasioned by water poured into Mount Ætna.

us, that before a shock the clouds remained motionless; and that, after a heavy shower of rain, a smart shock followed. These were phenomena that showed some connection between what passed in the earth and in the atmosphere: but betwixt these two there is no agent that we know of excepting electricity, at least there is none of sufficient strength to produce any violent effects by communication between the one and the other. The most enthusiastic imagination cannot suppose that huge cauldrons of boiling water under Mount Ætna should make the clouds stand still over Calabria; and the quick succession of the shock to an heavy shower of rain showed that the cause, whatever it was, lay in the ground on which the rain fell, and that it could be put in action by what affected the surface of the ground. But the cause of earthquakes appears, from the facts related n° 25, to lie at a greater depth in the earth than 396 feet; but no shower of rain could affect the earth to this depth unless by making some alteration in its electricity. These phenomena, which M. Dolomieu has overlooked, evidently show that electricity was concerned in this earthquake as well as others.

Another circumstance, which M. Dolomieu himself mentions, is a sufficient proof of electricity being concerned; and that is the presentiment which animals had of its approach. "The presentiment of animals (says he) at the approach of earthquakes, is a singular phenomenon, and which cannot fail to surprise us so much the more, as we know not by what organs it is communicated to them. Every species of animals experiences it, especially dogs, geese, and poultry. The howlings of the dogs in the streets of Messina were so loud, that orders were issued to kill them." Now, we know that many animals have a presentiment of a change of weather; which may happen either from a change of the density of the atmosphere, or from some alteration in its electricity: but steam pent up in the bowels of the earth could affect no animal until it began to exert its effects. Sir William Hamilton likewise informs us, that geese seemed more affected by this cause when in the water than out of it; which may easily be explained upon electrical principles, but not at all, at least not without the most extravagant suppositions, by steam pent up in caverns nobody knows where.

Again, it is evident that Mr Dolomieu's hypothesis is supported in the worst manner imaginable, viz. by arguing from things unknown to what we see; but the true method of argument always is from what we see to things unknown. By this unhappy error he has made choice of causes which cannot possibly answer the purpose. Let any quantity of water we please be poured into the focus of mount Ætna; nay, let the sea itself break into it: the consequence could only have been what happened in 1755, viz. not an earthquake in Calabria, but a vast effusion of boiling water from the top of the mountain itself. Nature here made the experiment; and we have no reason to imagine that any other consequence would have followed, though it had been repeated ever so often. Our author seems also to have forgot, that aqueous steam is capable of condensation, and that when it is admitted into a cold place it instantly loses its expansive power. Let us suppose caverns upon caverns extended in any

way he pleases: the greater their bulk, the more will he be embarrassed; for thus the steam would have room to circulate; and far from producing those dreadful convulsions, must have returned quietly into water, without being able to stir the earth in the least. It would appear indeed, that the power of aqueous steam is very much over-rated both by M. Dolomieu and other writers. An anonymous author in the *Journal de Physique* for August 1785, has drawn a comparison between volcanoes and steam-engines; and expresses his surprise that nobody has taken notice of it sooner. "A steam-engine (says he), consists of a caldron or boiler, covered with a lid, having an opening in the middle, to which is fitted an hollow cylinder, &c. The boiler is set over a fire, and from the water in it rises a vapour, the expansive force of which raises the piston of the machine. The action of the vapour is afterwards instantaneously annihilated by a jet of cold water into the cylinder through a hole, when the weight of the atmosphere takes place, forces down the piston, and consequently raises the water in the pump.

"It is known that vapour occupies a space 15,000 or 16,000 times greater than the bulk of the water which produced it; hence it follows, that the smaller the space is in which it is contained, the force of its expansion will be the greater. It has sometimes happened, that vapour, in a steam-engine, not having sufficient play, has burst the vessels in which it was contained, destroyed the building, and thrown the stones and boiling water to a great distance. It is now furnished with holes, by which the quantity of water can be ascertained, and with a valve which gives way when the vapour is superabundant. When the vapour issues by this valve, it strikes the air with such force as to occasion a very loud hissing noise. The force of vapour sufficient for raising a piston of a given diameter is equal to the weight of a column of water 22 feet in height, and of a base equal to the piston; so that, suppose a cubic foot of water to weigh 70 pounds, and the piston to be a foot square, the force of the vapour sufficient for raising it will be 1540 pounds; an agent so powerful, that hardly any thing else in nature can be compared with it.

"Now if we recollect the descriptions of volcanoes, their eruptions, the earthquakes and hissing noises which sometimes precede or accompany them; the stones of different sorts, boiling water, sulphur, and bitumens which they discharge; if we hear of rocks thrown to the distance of seven or eight miles from the mouth of the volcano; clouds of ashes, and torrents of lava, seas overflowing, rivers left dry, &c. &c. we will find all these the effects of great natural steam-engines: that is to say, they are produced by masses of combustible matter set on fire by fermentation, placed in the neighbourhood of caverns filled with the waters of the sea, of rivers or lakes. We cannot doubt that the interior parts of the earth are hollowed out into numberless caverns that extend in different directions, and to various depths; and that mountains and other inequalities, and the buildings raised by men, are merely the lid or covering, more or less thick, of these caverns, which vary in shape, and in the materials of which they are composed. Places therefore covered with buildings and mountains, are more liable

Earth-quake.

96
Comparison between volcanoes and steam-engines.97
Volcanoes, earthquakes, &c. all supposed to be owing to steam.

Earth-
quake.

ble to earthquakes, because they are less able to give way to the shock: and the farther places are distant from volcanoes, the less they have to fear from earthquakes; because the vapour having room to expand itself by the ramifications of the subterraneous passages, the shocks will be less violent and less frequent. It is this which, in all probability, has hitherto saved Naples.

"Now, let it not be said, that we have mistaken the cause of earthquakes: for if, on the one hand, we attentively consider the steam-engine and its effects, and on the other, observe volcanoes always in the neighbourhood of water, we will be convinced, that they differ in nothing from that machine, but because this is under the command and direction of art. The disappearance and formation of islands and mountains may be explained from the sinking in of caverns, or from their being lifted up by the force of vapour.—Lastly, those vapours which, in the year 1783, covered at the same time, and almost during four months, a part of Europe, Asia, and Africa, were probably vapour escaped from those great internal caverns, heated by a sufficient quantity of combustible matters, set on fire by fermentation in the great chemical laboratories in the bowels of the earth. In certain districts of Burgundy, these vapours were found to be hot, for they dried up and destroyed the grapes."

98
This hypothesis is utterly insufficient.

99
Excessive pressure of the atmosphere to be overcome before an earthquake can take place.

* See n^o 77.

100
Power of steam generally over-rated.

That the power of steam-engines is very great, there is no doubt; but all that we see them usually perform, is little more than merely overcoming the pressure of the atmosphere on the piston of the cylinder. Now this pressure is equally strong over the whole surface of the earth; so that before the ground could be shaken in the smallest degree, the whole pressure of the atmosphere incumbent upon it must be removed. But if we begin to make any calculations with regard even to this force, which must be removed as a preliminary, we shall find it to be inconceivably great. A square mile contains 27,878,400 square feet; and upon each of these the pressure is 2160 pounds. The atmospheric pressure on a square mile is the product of these two numbers, or 60,217,344,000 pounds; but the great earthquake of 1755 shook no less than 4,000,000 of square miles of the earth; and therefore must in the first place have overcome a pressure of more than 240,000 millions of millions of pounds: and after all this, it had still a much greater obstacle, viz. the immense weight and cohesion of the earth itself. Dr Stukely* has calculated, that no conceivable quantity of gunpowder could have moved the earth shaken by the earthquake in Asia Minor, which affected a circle of 300 miles diameter: but the earthquake of 1755 must have required not only a much greater power to move the earth, as affecting a surface much greater than that of a circle 300 miles in diameter, but also the atmospheric pressure above mentioned, which does not enter into the Doctor's calculation. There cannot therefore be any conceivable quantity of water, of fire, or of steam in the bowels of the earth, sufficient to produce such effects; nor is there any power in nature to which we can with the smallest probability attribute them, electricity alone excepted. Calculations have indeed been made, that the force of steam is 28 times greater than that of gunpowder: but this seems only to be in one particular case, viz. when water is thrown upon melted

copper; which cannot possibly take place in the bowels of the earth. In other cases water explodes with much less violence; and, when thrown upon melted glass, does not explode at all. The very violent effects of water when thrown upon copper in fusion, therefore, most probably are to be attributed to a decomposition of the water, one part of it being united to the calx of the metal, and the other suddenly converted into an aerial vapour; the instantaneous production and rarefaction of which seems in most cases to be the cause of explosion*. The simple pressure of steam, and the bursting of a vessel by it when long continued, cannot at all be introduced as a parallel case, nor are the effects in any degree similar; because we cannot imagine solid metallic vessels in the bowels of the earth to confine the steam till it acquired such strength. At all events the steam must have penetrated the loose earth, which it could not fail to meet with in many places, loosened it, and condensed itself; and if any person will cover a steam engine with stones and rubbish instead of a close lid, he will certainly find this to be the case.

The only power with which we are acquainted, and which is capable of producing earthquakes, then, being that of the electrical fluid, it only remains to consider what uses they may be thought to answer in the system of nature. As they are the effects of the very highest natural power, it cannot be supposed that they are produced merely for the purposes of destruction; and, on the other hand, as they certainly do a great deal of mischief, it seems as difficult to assign any benevolent purpose they can answer. It is very generally supposed, indeed, that earthquakes are the means by which Nature raises mountains and land from the bottom of the sea; but this can never be admitted. We have many instances of mountains being swallowed up and lost by earthquakes, but not a single well attested one of a mountain being raised by them; and even when volcanoes are taken into the account, by which some mountains and islands have certainly been raised, the balance appears against them, and more land seems to have been sunk by them than ever was raised*. It seems most probable therefore that earthquakes are accidental, and that the mischief they do is only to prevent a greater evil. This we see takes place throughout the whole system of nature. Thunder and lightning, violent rains, storms of wind, &c. are all productive of much damage on certain occasions; but we by no means suppose these phenomena to take place merely for destruction; and therefore we name such effects accidents. To the same account, though on a larger scale, must we place earthquakes; and it only now remains to consider what are the disasters still more terrible than earthquakes which we should have occasion to dread, did they not interpose to prevent them.

These evils are naturally to be dreaded from any general commotion of the electric fluid dispersed throughout the whole globe of earth. That it does pervade it to the centre, is what we can have no reason to doubt; but in the internal parts it seems to lie dormant, or to be employed in operations which never manifest themselves to us. Towards the surface it is manifestly set in motion by the light of the sun; which, as proved under the article ELECTRICITY, and in various other parts of this work, is the very same fluid. This produces

Earth-
quake.

101
Explosion of water with copper probably occasioned by a decomposition.

* See Explosion.

102
Of the uses of earthquakes.

103
They cannot be the means of raising mountains.

* See Volcano.

104
Are probably accidental circumstances, by which greater evils are prevented.

Earth-quake.
105
A constant current of electric matter from the equator to the poles.

106
Dreadful consequences of an universal commotion in the electric fluid.

107
Why this can never take place.

108
Progress of the electric matter discernible after the earthquake in Calabria.

109
Occasions of violent eruptions of fire in Greenland and Iceland.

110
Violent thunder-storms throughout all Europe.

111
Appears in the great meteor of 1783.

duces a constant current through the bowels of the earth from the equator towards the poles; for as the equatorial parts absorb more of the light than those farther south or north, it must naturally be driven out in the northern and southern regions in proportion to the quantity absorbed at the equator. In what manner earthquakes are then produced by it, has already been explained at length. They are the shocks occasioned by its passing in great quantity from one place where it is pressed and confined, to another from which it has a free passage; or from a part of the earth positively electrified, to one that is negatively so. Let us suppose, however, that such obstructions are thrown in its way, that it cannot get out of the earth by any passage. The consequence of this must very soon be, that the motion of the light acting upon the equatorial parts would be propagated through the whole globe; and this would be productive of consequences much more terrible than any we can conceive. We see that by setting it in motion in a small part of the atmosphere or of the earth, the most violent effects ensue; but should this tremendous fluid be obliged to put forth all its strength, the earth must be shaken from the centre. Instead of plantations and little hills removed from their places, as in Calabria, it is more than probable that the largest islands and continents would be detached from their bases, or perhaps an universal dissolution ensue. Happily, however, such an effect never can take place, because the electric matter always vents itself by the superficial parts; for the depths to which even the causes of earthquakes and volcanoes descend, are undoubtedly superficial in comparison of the vast thickness of the body of the earth itself. The great bulk of electric fluid therefore lies quietly in the central parts; and is never moved by the commotions of that which lies on the surface, any more than the water at the bottom of the ocean is moved by the storms which ruffle the upper part.

In the earthquakes in Calabria, the progress of the electric matter northward might be traced both thro' the bowels of the earth and through the atmosphere. The great shocks happened in the month of February, but continued more or less through the whole summer. It was observed that Stromboli smoked less than usual, and no particular eruption happened either of *Ætna* or *Vesuvius*. This showed that the electric matter was going somewhere else; nor was it long of discovering the course it had taken. In the beginning of summer a violent volcanic eruption took place in Greenland; its extent and power, however, were not known; but in the beginning of June a volcanic earthquake commenced in Iceland, and continued for eleven days without intermission. This was followed by the most extraordinary effusion of lava recorded in history, which continued till the 12th of August. All this time there were violent and numerous thunder storms, first in the southern and then in the more northerly parts of Europe; the air was covered with a never-ceasing haze, not of a moist nature, as our author in the *Journal de Physique* supposes, and which he absurdly says dried the grapes in Burgundy, but plainly of some other kind, and which prevented the light of the sun from having its usual effect. Six days after the immense volcanic eruption in Iceland had ceased, the great meteor made its appearance, which no doubt

was the very same quantity of electric matter that had raised such horrid commotions in the earth and atmosphere, returning thro' the higher spaces to the south from whence it had originally proceeded.

Before we dismiss this article, it may still be necessary to obviate an objection which may be raised from what is said under the article *LIGHTNING*. It is there shown, that in the time of a thunder storm, the parts of the earth which lie directly under the cloud are divided for some space downward into alternate zones positively and negatively electrified; that the lightning from the cloud strikes not the uppermost stratum directly, but only as it is impossible to avoid it, because it lies betwixt the cloud and the zone by which the electric matter is attracted. It may then be asked, Why an earthquake is not produced by the discharge of these two opposite electricities into one another directly, without the production of any thunder? Here, however, we must observe, that the electricity is originally accumulated in the atmosphere, where the vapours serve as conductors, and the surrounding air and upper surface of the earth being electrified the same way, prevent the electric matter from silently discharging itself, by insulating the clouds in the same manner that the conductor of a machine is insulated by the electric substance on which it stands. The flash of lightning must therefore burst out from these conductors in the very same manner that a spark proceeds from the prime conductor of an electrical machine, rather than from the globe or atmosphere next to it, though both of them are undoubtedly very highly electrified at the time the machine is set in motion. At the same time it must be considered, that this continual flashing of the atmospherical electricity towards the earth, prevents any very high degree of it from accumulating in either of the terrestrial zones already mentioned, so as to produce any discharge between them, which would indeed produce a shock of an earthquake.

From an unhappy accident which happened in 1785, related by Mr Brydone in the *Phil. Trans.* for that year, we learn, that though in a thunder storm the atmospherical electricity and that of the earth are the same, yet at some distance there is a difference betwixt them, and discharges are made from the one to the other.

The accident alluded to was the destruction of a man and two horses by an electrical explosion from the earth in the time of a thunder storm. At the place where the explosion happened, there was an interval of 25 or 30 seconds betwixt the flash and the clap of thunder, so that it must have been at the distance of between five and six miles; the great explosion suddenly burst out from the spot over which the cart-wheels passed to which the horses were yoked, partially melted the iron of the wheels, killed the man who sat on the fore-part of the cart, and tore his clothes almost to pieces. Two circular holes of about 20 inches diameter were made in the ground, and the earth and stones scattered about; but no fire was perceived. About an hour before the explosion, some fishermen were caught in a violent whirlwind, which felt hot and sultry. A lamb was killed by another explosion about a quarter of an hour before the great one, and a woman received a violent stroke on the foot without being able to tell whence it proceeded. At the time the lamb was killed, the shepherd

Earth-quake.

112

Why earthquakes do not happen in the time of thunder storms.

113

Of electrical explosions proceeding from the earth.

114

A fatal accident by one of them accounted for.

Earth-quake.

shepherd said he felt a sensation as if fire had passed over his face.

115
Earth-
quakes can-
not happen
where there
is a differ-
ence be-
twixt the
electricity
of the at-
mosphere
and that of
the earth.

By these explosions, particularly the great one, the equilibrium of electricity in the atmosphere was instantly restored, and the clouds forthwith began to separate. The reason of this is explained under the article LIGHTNING; here it is sufficient to observe, that where there is a difference between the electricity of the atmosphere and that of the earth, an earthquake cannot happen. Those electrical explosions experimentally demonstrate the truth of what is argued from the principles of electricity, n° 82, viz. that just before an earthquake there is a perfect equilibrium between the electricity of the atmosphere and that of the surface of the earth. When this equilibrium is broken, the earth discharges its superfluous quantity either silently, by means of trees, grafs, &c. or sometimes by explosions in different places; but as there is no general conductor, there cannot be any general discharge of the whole at once. The singular case of the great discharge in 1785 was owing only to the accidental presence of a good conductor, viz. the iron of the cart-wheels passing over the spot where the electric matter happened to be collected in great quantity. Had not this taken place, it is possible that a fire-ball might have risen from the earth; for the explosion produced effects extremely similar to those of the bursting of fire-balls*: but still this could have no effect in producing any shock of an earthquake; because the latter would have required a general discharge betwixt two great strata of earth, where there cannot be any conductor to make partial ones.

* See Light-
ning and
Meteors.

116
Conical
hollows in
the earth
observed by
Sir William
Hamilton
accounted
for.

In the time of earthquakes, however, there are undoubtedly many such electrical discharges from the earth as those just mentioned; and they are most probably the cause of those conical hollows observed by Sir William Hamilton. When water is abundant in any part of the earth, it serves as a conductor for some quantity of the electricity, and that fluid is violently thrown out into the air: but where there is a deficiency of water, the fire breaks forth in its proper form with loud explosions, as was observed; as well as the water spouts in Calabria in the year 1783. That year also the quantity of electric matter discharged by the earth into the air was manifest by the vast number of thunder storms which immediately followed them. No fire was observed at the time of the explosion which put an end to the thunder-storm above mentioned; but this must have arisen partly from its happening in the day-time, and partly from the electric matter having so many conductors to spend its force upon.

117
Ultimate
cause of all
the pheno-
mena.

Having thus explained all the phenomena attending earthquakes, it remains only to show by what means the equilibrium of electricity can be broken in the bowels of the earth in such a manner as to produce these phenomena. The ultimate cause of this is mentioned under the article AURORA BOREALIS, n° 5. It is there shown, that the warmth of the sun must necessarily bring down to the earth much greater quantities of electric matter in the regions within the tropics than in the northern and southern climates. It is impossible, as is there also observed, that there can be a perpetual accumulation of electricity in one part of the earth, unless there is a passage for it into the atmosphere

through some other. Hence, if the electric matter descends from the air into one place of the earth, it must necessarily ascend from the earth into the air in some other place. There must be therefore a continual current of electricity through the bowels of the earth, beginning at the equator, and extending northward and southward to both poles. While this current has a free passage from the earth in the northern and southern regions, every thing goes on quietly; and whatever storms may happen in the atmosphere, the solid earth cannot be affected. Innumerable circumstances, however, may tend to hinder this discharge, and consequently to accumulate the electric matter in particular places. One very obvious cause of this kind, is an excessive frost taking place in any part of the earth whence the electric matter was wont to be discharged. This renders the air itself so electric, that it cannot receive the fluid; at the same time that the water on the surface of the earth, being hard frozen, becomes electric also, and incapable of conducting. Very dry seasons likewise contribute to produce the same effect; and thus the accumulation of electricity in the warmer climates becomes prodigiously great. Hence perhaps we have some reason to conclude, that the excessive cold which prevailed over all Europe in 1782 was a principal cause of the earthquakes in 1783.

Earth-quake.

It must, however, be observed, that with regard to the operations of nature we cannot always reason analogically from our electric experiments. If a quantity of electricity is collected in any substance by artificial means, that quantity is taken off in a moment by the touch of any metallic substance or other good conductor. As the whole earth, therefore, is filled with a conducting substance, namely water, it may very naturally be asked, Why does not the superfluous quantity of electric matter collected in one place, immediately disperse itself through all other parts of the earth by means of the water with which it abounds?—To obviate this difficulty, however, it needs only be remembered, that as the earth is quite full of electric matter all round, no quantity can enter any particular part without being resisted by the rest which is diffused through the whole globe. This resistance will be proportioned to the facility with which it can escape at other places; and this it never can do, unless the earth is in a proper condition for emitting, and the atmosphere for receiving, it. The pressure, therefore, upon the accumulated quantity of electric matter soon becomes exceedingly great, and its disposition to burst out with violence is every day increased. At last, as the sun still continues to occasion the descent of more and more of the electric fluid, that particular part of the earth becomes fully charged. The consequence of this is, that the waters of fountains become foul; the electric matter being lodged in great quantity in the water, forces it into unusual agitations, by which the earth is mixed with it. The ocean, for the same reason, is raised in huge billows, &c.; and these appearances prognosticate the shock, in the same manner that slight flashes from the knob of an electrified bottle prognosticate a discharge of all the electricity contained in it.

Besides the earthquakes above described, of which the cause seems to depend entirely on a collection of electric matter in the bowels of the earth, there are others frequently felt in the neighbourhood of volcanoes, which

Easel
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Easter-
Island.

which are plainly owing to the efforts of the burning matter to discharge itself. These, however, are but slight, and seldom extend to any considerable distance from the burning mountain. For a particular account of them, see the article VOLCANO.

EASEL PIECES, among painters, such smaller pieces, either portraits or landscapes, as are painted on the easel, i. e. the frame whereon the canvas is laid.— They are thus called, to distinguish them from larger pictures drawn on walls, cieling, &c.

EASEMENT, in law, a privilege or convenience which one neighbour has of another, whether by charter or prescription, without profit: such are a way through his lands, a sink, or the like. These, in many cases, may be claimed.

EASING, in the sea-language, signifies the slackening a rope or the like. Thus, to ease the bow-line or sheet, is to let them go slacker; to ease the helm, is to let the ship go more large, more before the wind, or more larboard.

EAST, one of the four cardinal points of the world; being that point of the horizon where the sun is seen to rise when in the equinoctial.

The word *east* is Saxon. In Italy, and throughout the Mediterranean, the east wind is called the *levante*: in Greek, ἀνατολή and ἀπηναιώτης, because it comes from the side of the sun, ἀπ' ἡλίου; in Latin, *eurus*.

EASTER, a festival of the Christian church, observed in memory of our Saviour's resurrection.

The Greeks call it *pasga*, the Latins *pascha*, an Hebrew word signifying *passage*, applied to the Jewish feast of the passover. It is called *easter* in English, from the goddess Eostre, worshipped by the Saxons with peculiar ceremonies in the month of April.

The Asiatic churches kept their easter upon the very same day the Jews observed their passover, and others on the first Sunday after the first full moon in the new year. This controversy was determined in the council of Nice; when it was ordained that easter should be kept upon one and the same day, which should always be a Sunday, in all Christian churches in the world. For the method of finding easter by calculation, see CHRONOLOGY, n° 31.

EASTER Island, an island in the South Sea, lying in N. Lat. 27. 5. W. Long. 109. 46. It is thought to have been first discovered in 1686 by one DAVIS an Englishman, who called it *Davis's Land*. It was next visited by Commodore Roggewein, a Dutchman, in 1722; who gave it the name of *Easter Island*, and published many fabulous accounts concerning the country and its inhabitants. It was also visited by a Spanish ship in 1770, the captain of which gave it the name of *St Carlos*. The only authentic accounts of this island, however, which have yet appeared, are those published by Captain Cook and Mr Forster, who visited it in the month of March 1774.—According to these accounts, the island is about 10 or 12 leagues in circumference, and of a triangular figure; its greatest length from north-west to south-east is about four leagues, and its greatest breadth two. The hills are so high, that they may be seen at the distance of 15 or 16 leagues. The north and east points of the island are of a considerable height; between them, on the south-east side, the shore forms an open bay, in which Captain Cook thinks the Dutch anchored in 1722. He himself anchored on the west side of the island, three miles northward from the south point. This, he says, is a good road with easterly winds; but a dangerous one when the wind blows from the contrary quarter, as the other on the south-east side must be with easterly winds: so that there is no good accommodation to be had for shipping round the whole island.

The island itself is extremely barren; and bears evident marks not only of a volcanic origin, but of having been not very long ago entirely ruined by an eruption. As they approached the south point, Mr Forster informs us, that they observed the shore to rise perpendicularly. It consisted of broken rocks, whose cavernous appearance, and black or ferruginous colour, seemed to indicate that they had been thrown up by subterraneous fire. Two detached rocks lie about a quarter of a mile off this point: one of them is singular on account of its shape, and represents a huge column or obelisk; and both these rocks were inhabited by multitudes of sea-fowls. On landing and walking into the country, they found the ground covered with rocks and stones of all sizes, which appeared to have been exposed to a great fire, where they seemed to have acquired a black colour and porous texture. Two or three shrivelled species of grasses grew among these stones, and in some measure softened the desolate appearance of the country. The farther they advanced, the more ruinous the face of the country seemed to be. The roads were intolerably rugged, and filled with heaps of volcanic stones, among which the Europeans could not make their way but with the greatest difficulty; but the natives leaped from one stone to another with surprising agility and ease. As they went northward along the island, they found the ground still of the same nature; till at last they met with a large rock of black melted lava, which seemed to contain some iron, and on which was neither soil nor grass, nor any mark of vegetation. Notwithstanding this general barrenness, however, there are several large tracts covered with cultivated soil, which produces potatoes of a gold yellow colour, as sweet as carrots, plantains, and sugar-canes. The soil is a dry hard clay; and the inhabitants use the grass which grows between the stones in other parts of the island as a manure, and for preserving their vegetables when young from the heat of the sun.

The most remarkable curiosity belonging to this island is a number of Colossian statues; of which, however, very few remain entire. These statues are placed only on the sea-coast. On the east side of the island were seen the ruins of three platforms of stone-work, on each of which had stood four of these large statues; but they were all fallen down from two of them, and one from the third: they were broken or defaced by the fall. Mr Wales measured one that had fallen, which was 15 feet in length, and six broad over the shoulders: each statue had on its head a large cylindrical stone of a red colour, wrought perfectly round. Others were found that measured near 27 feet, and upwards of eight feet over the shoulders; and a still larger one was seen standing, the shade of which was sufficient to shelter all the party, consisting of near 30 persons, from the rays of the sun. The workmanship is rude, but not bad, nor are the features of the face ill formed; the ears are long, according to the distortion

Easter-
Island.

Easter-
Island.

tion practised in the country, and the bodies have hardly any thing of a human figure about them. How these islanders, wholly unacquainted with any mechanical power, could raise such stupendous figures, and afterwards place the large cylindric stones upon their heads, is truly wonderful! The most probable conjecture seems to be, that the stone is factitious; and that each figure was gradually erected, by forming a temporary platform round it, and raising it as the work advanced: but they are at any rate very strong proofs of the ingenuity and perseverance of the islanders in the age when they were built, as well as that the ancestors of the present race had seen better days than their descendants enjoy. The water of this island is in general brackish, there being only one well that is perfectly fresh, which is at the east end of the island: and whenever the natives repair to it to slake their thirst, they wash themselves all over; and if there is a large company, the first leaps into the middle of the hole, drinks, and washes himself without ceremony; after which another takes his place, and so on in succession. This custom was much disrelished by their new friends, who stood greatly in need of this valuable article, and did not wish to have it contaminated by such ablutions.

The people are of a middle size. In general they are rather thin; go entirely naked; and have punctures on their bodies, a custom common to all the inhabitants of the South Sea islands. Their greatest singularity is the size of their ears, the lobe of which is stretched out so that it almost rests on their shoulder; and is pierced with a very large hole, capable of admitting four or five fingers with ease. The chief ornaments for their ears are the white down of feathers and rings which they wear in the inside of the hole, made of the leaf of the sugar-cane, which is very elastic, and for this purpose is rolled up like a watch-spring. Some were seen clothed in the same cloth used in the island of Otaheite, tinged of a bright orange-colour with turmeric; and these our voyagers supposed to be chiefs. Their colour is a chestnut-brown; their hair black, curling, and remarkably strong; and that on the head as well as the face is cut short. The women are small, and slender-limbed: they have punctures on the face, resembling the patches sometimes used by European ladies; they paint their face all over with a reddish brown ruddle, and above this they lay a fine orange-colour extracted from turmeric-root; the whole is then variegated with streaks of white shell-lime. But the most surprising circumstance of all with regard to these people, is the apparent scarcity of women among them. The nicest calculation that could be made, never brought the number of inhabitants in this island to above 700, and of these the females bore no proportion in number to the males. Either they have but few females, or else their women were restrained from appearing during the stay of the ship; notwithstanding, the men showed no signs of a jealous disposition, or the women any scruples of appearing in public: in fact, they seemed to be neither reserved nor chaste; and the large pointed cap which they wore gave them the appearance of professed wantons. But as all the women who were seen were liberal of their favours, it is more than probable that all the married and modest ones had concealed themselves from their impetuous visitants in

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some inscrutable parts of the island; and what further strengthens this supposition is, that heaps of stones were seen piled up into little hillocks, which had one steep perpendicular side, where a hole went under ground. The space within, says Mr Forster, could be but small; and yet it is probable that these cavities served, together with their miserable huts, to give shelter to the people at night; and they may communicate with natural caverns, which are very common in the lava currents of volcanic countries. The few women that appeared were the most lascivious of their sex that perhaps have been ever noticed in any country, and shame seemed to be entirely unknown to them.

EATON, a town of Buckinghamshire, situated on the north side of the Thames, opposite to Windsor, and famous for its collegiate school, founded by King Henry VI. being a seminary for King's College, Cambridge, the fellows of which are all from this school.

EAU DE CARMES. See PHARMACY.

EAU de Luce. See CHEMISTRY, n° 1037.

EAVES, in architecture, the margin or edge of the roof of an house; being the lowest tiles, slates, or the like, that hang over the walls, to throw off water to a distance from the wall.

EAVES-DROPPERS, are such persons as stand under the eaves, or walls, and windows of a house, by night or day, to hearken after news, and carry it to others, and thereby cause strife and contention in the neighbourhood. They are called *evil members of the commonwealth* by the stat. of West. 1. c. 33. They may be punished either in the court-leet by way of presentment and fine, or in the quarter-sessions by indictment and binding to good behaviour.

EBBING OF THE TIDES. See TIDE.

EBDOMARIUS, in ecclesiastical writers, an officer formerly appointed weekly to superintend the performance of divine service in cathedrals, and prescribe the duties of each person attending in the choir, as to reading singing, praying, &c. To this purpose the ebdomary, at the beginning of his week, drew up in form a bill or writing of the respective persons, and their several offices, called *tabula*, and the persons there entered were styled *intabulati*.

EBDOME, *ἑβδομή*, in antiquity, a festival kept on the seventh of every lunar month, in honour of Apollo, to whom all seventh days were sacred, because one of them was his birth-day; whence he was sometimes called *Ebdomagenes*. For the ceremonies of this solemnity see *Potter's Archaeol. Græc.* lib. ii. cap. 20.

EBENUS, the EBONY TREE: A genus of the dicandria order, belonging to the diadelphia class of plants: and in the natural method ranking under the 32d order, *Papilionaceæ*. The segments of the calyx are the length of the corolla, and the latter has scarce any alæ: there is one rough seed. There is but one species, the cretica, a native of the island of Crete, and some others in the Archipelago. It rises with a shrubby stalk three or four feet high; which puts out several side-branches garnished with hoary leaves at each joint, composed of five narrow spear-shaped lobes, which join at their tails to the footstalk, and spread out like the fingers of a hand. The branches are terminated by thick spikes of large purple flowers, which are of the butterfly or pea-bloom kind. The plants may be propagated from seeds sown in the autumn. In this coun-

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try

Eaton
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Ebenus.

Ebion,
Ebionites.

try the plants must be protected during the winter, as they are unable to bear the cold.

EBION, the author of the heresy of the EBIONITES, was a disciple of Cerinthus, and his successor. He improved upon the errors of his master, and added to them new opinions of his own. He began his preaching in Judea: he taught in Asia, and even at Rome. His tenets infected the isle of Cyprus. St John opposed both Cerinthus and Ebion in Asia; and it is thought, that this apostle wrote his gospel, in the year 97, particularly against this heresy.

EBIONITES, ancient heretics, who rose in the church in the very first age thereof, and formed themselves into a sect in the second century, denying the divinity of Jesus Christ.

Origen takes them to have been so called from the Hebrew word *ebion*, which in that language signifies *poor*; because, says he, they were poor in sense, and wanted understanding. Eusebius, with a view to the same etymology, is of opinion they were thus called, as having poor thoughts of Jesus Christ, taking him for no more than a mere man.

It is more probable the Jews gave this appellation to the Christians in general out of contempt; because in the first times there were few but poor people that embraced the Christian religion. This opinion Origen himself seems to give into, in his book against Celsus, where he says, that they called *Ebionites*, such among the Jews as believed that Jesus was truly the expected Messiah.

It might even be urged, with some probability, that the primitive Christians assumed the name themselves, in conformity to their profession. It is certain, Epiphanius observes, they valued themselves on being poor, in imitation of the apostles. The same Epiphanius, however, is of opinion, that there had been a man of the name EBION, the chief and founder of the sect of Ebionites, contemporary with the Nazarenes and Cerinthians. He gives a long and exact account of the origin of the Ebionites, making them to have risen after the destruction of Jerusalem, when the first Christians, called *Nazarenes*, went out of the same to live at Pella.

The Ebionites are little else than a branch of Nazarenes; only that they altered and corrupted, in many things, the purity of the faith held among those first adherents to Christianity. For this reason, Origen distinguishes two kinds of Ebionites, in his answer to Celsus: the one believed that Jesus Christ was born of a virgin; and the other, that he was born after the manner of other men.

The first were orthodox in every thing, except that to the Christian doctrine they joined the ceremonies of the Jewish law, with the Jews, Samaritans, and Nazarenes; together with the traditions of the Pharisees. They differed from the Nazarenes, however, in several things, chiefly as to what regards the authority of the sacred writings; for the Nazarenes received all for scripture contained in the Jewish canon; whereas the Ebionites rejected all the prophets, and held the very names of David, Solomon, Isaiah, Jeremiah, and Ezekiel, in abhorrence. They also rejected all St Paul's epistles, whom they treated with the utmost disrespect.

They received nothing of the Old Testament but the Pentateuch; which should intimate them to have descended rather from the Samaritans than from the Jews. They agreed with the Nazarenes in using the

Hebrew gospels of St Matthew, otherwise called the Gospel of the Twelve Apostles; but they had corrupted their copy in abundance of places; and particularly, had left out the genealogy of our Saviour, which was preserved entire in that of the Nazarenes, and even in those used by the Corinthians.

Some, however, have made this gospel canonical, and of greater value than our present Greek gospel of St Matthew: See NAZARENES. These last, whose sentiments, as to the birth of our Saviour, were the same with those of the Ebionites, built their error on this very genealogy.

Beside the Hebrew gospel of St Matthew, the Ebionites had adopted several other books, under the names of St James, John, and the other apostles: they also made use of the Travels of St Peter, which are supposed to have been written by St Clement; but had altered them so, that there was scarce any thing of truth left in them. They even made that saint tell a number of falsehoods, the better to authorise their own practices. See St Epiphanius, who is very diffusive on the ancient heresy of the Ebionites, *Har.* 30. But his account deserves little credit, as, by his own confession, he has confounded the other sects with the Ebionites, and has charged them with errors to which the first adherents of this sect were utter strangers.

EBONY OF CRETE. See EBENUS.

EBONY Wood is brought from the Indies, exceedingly hard and heavy, susceptible of a very fine polish, and on that account used in mosaic and inlaid works, toys, &c. There are divers kinds of ebony: the most usual among us are black, red, and green, all of them the product of the island of Madagascar, where the natives call them indifferently *bazon maintsi*, q. d. *black wood*. The island of St Maurice, belonging to the Dutch, likewise furnishes part of the ebonyes used in Europe.

Authors and travellers give very different accounts of the tree that yields the black ebony. By some of their descriptions, it should be a sort of palm-tree; by others, a cytusus, &c. The most authentic of them is that of M. Flacourt, who resided many years in Madagascar as governor thereof; he assures us, that it grows very high and big, its bark being black, and its leaves resembling those of our myrtle, of a deep, dusky, green colour.

Tavernier assures us, that the islanders always take care to bury their trees, when cut down, to make them the blacker, and to prevent their splitting when wrought. F. Plumier mentions another black ebony-tree, discovered by him at St Domingo, which he calls *spartium portulacæ foliis aculeatum ebeni materia*. Candia also bears a little shrub, known to the botanists under the name of *EBENUS Cretica*, above described.

Pliny and Dioscorides say the best ebony comes from Ethiopia, and the worst from India; but Theophrastus prefers that of India. Black ebony is much preferred to that of other colours. The best is a jet black, free of veins and rind, very massive, astringent, and of an acrid pungent taste. Its rind, infused in water, is said to purge puita, and cure venereal disorders; whence Matthioli took guaiacum for a sort of ebony. It yields an agreeable perfume when laid on burning coals: when green, it readily takes fire from the abundance of its fat. If rubbed against a stone, it becomes brown. The Indians make statues of their gods, and

Ebony.

Eboracum and sceptres for their princes, of this wood. It was first brought to Rome by Pompey, after he subdued Mithridates. It is now much less used among us than anciently; since the discovery of so many ways of giving other hard woods a black colour.

As to the green ebony, besides Madagascar and St Maurice, it likewise grows in the Antilles, and especially in the isle of Tobago. The tree that yields it is very bushy; its leaves are smooth, and of a fine green colour. Beneath its bark is a white blea, about two inches thick; all beneath which, to the very heart, is a deep green, approaching towards a black, tho' sometimes streaked with yellow veins. Its use is not confined to mosaic work: it is likewise good in dyeing, as yielding a fine green tincture. As to red ebony, called also *grenadilla*, we know little of it more than the name.

The cabinet-makers, inlayers, &c. make pear-tree and other woods pass for ebony, by giving them the black colour thereof. This some do by a few washes of a hot decoction of galls; and when dry, adding writing ink thereon, and polishing it with a stiff brush, and a little hot wax; and others heat or burn their wood black. See DYEING.

EBORACUM (anc. geog.), a famous city of the Brigantes in Britain, the residence of Septimius Severus and Constantius Chlorus, and where they both died; a Roman colony; and the station of the Legio Sexta Victrix. Now York. W. Long. 50. Lat. 54. *Caer-frock*, or *Caer-effroc*, in British (Camden).

EBRO, anciently **IBERUS**, a large river of Spain, which, taking its rise in Old Castile, runs thro' Biscay and Arragon, passes by Saragosa, and, continuing its course thro' Catalonia, discharges itself with great rapidity into the Mediterranean, about 20 miles below the city of Tortosa.

EBUDÆ, or **HEBUDÆ** (anc. geog.), islands on the west of Scotland. The ancients differ greatly as to their situation, number, and names; said in general to lie to the north of Ireland and west of Scotland. Now called the *Western Isles*, also *Hebrides*; this last a modern name, the reason of which does not appear, unless it be a corruption of *Hebudes*. By Beda called *Mevania*, an appellation equally obscure.

EBULLITION, the same with **BOILING**. The word is also used in a synonymous sense with **EFFERVESCENCE**.

EBUSUS (anc. geog.), the greater of the two islands called Pityusæ, in the Mediterranean, near the east coast of Spain, to the south-west of Majorca. Famous for its pastures for cattle, and for its figs. Now *Ivica*, 100 miles in compass, without any noxious animals but rabbits, who often destroy the corn.

ECALÉSIA, *Εκαλῆσια*, in antiquity, a festival kept in honour of Jupiter, surnamed *Hecalus*, or *Hecalesius*, from *Hecale*, one of the borough-towns in Attica.

ECASTOR, in antiquity, an oath wherein Castor was invoked. It was a custom for the men never to swear by Castor, nor the women by Pollux.

ECATÆA, *Εκαταῖα*, in antiquity, statues erected to the goddess Hecate, for whom the Athenians had a great veneration, believing that she was the overseer of their families, and that she protected their children.

ECATESIA, *Εκατηστία*, in antiquity, an anniversary solemnity, observed by the Stratonicensians, in honour

of Hecate. The Athenians likewise had a public entertainment or supper every new moon, in honour of the same goddess. The supper was provided at the charge of the richer sort; and was no sooner brought to the accustomed place but the poor people carried all off, giving out that Hecate had devoured it. For the rest of the ceremonies observed on this occasion, see *Pott. Arch. Græc. lib. ii. cap. 20.*

ECATOMBÆON, *Εκατομβαιών*, in chronology, the first month of the Athenian year. It consisted of 30 days, and began on the first new moon after the summer solstice, and consequently answered to the latter part of our June and beginning of July. The Boeotians called it *Hippodromus*, and the Macedonians *Lous*. See MONTH. The word is a derivative from the Greek *ἑκατομβή*, a *hecatomb*, because of the great number of hecatombs sacrificed in it.

ECAVESSADE, in the manege, is used for a jerk of the cavesson.

ECBATANA (anc. geog.), the royal residence and the capital of Media, built by Deioces king of the Medes, according to Herodotus: Pliny says, by Seleucus; but that could not be, because it is mentioned by Demosthenes. It was situated on a gentle declivity, distant 12 stadia from Mount Orontes, and was in compass 150 stadia. Here stood the royal treasury and tombs. It was an open unwall'd town, but had a very strong citadel, encompassed with seven walls, one within and rising above another. The extent of the utmost was equal to the whole extent of Athens, according to Herodotus; the situation favouring this construction, as being a gentle ascent, and each wall was of a different colour.—Another *Ecbatana* of Persia, a town of the Magi (Pliny).—A third of Syria.

ECCENTRICITY. See **EXCENTRICITY**.

ECHELLENSIS (Abraham), a learned Maronite, whom the president le Jai employed in the edition of his Polyglott Bible. Gabriel Sionita, his countryman, drew him to Paris, in order to make him his fellow-labourer in publishing that bible. They fell out: Gabriel complained to the parliament, and cruelly defamed his associate; their quarrel made a great noise. The congregation *de propaganda fide* associated him, 1636, with those whom they employed in making an Arabic translation of the scripture. They recalled him from Paris, and he laboured in that translation at Rome in the year 1652. While he was professor of the Oriental languages at Rome, he was pitched upon by the great duke Ferdinand II. to translate from Arabic into Latin the 5th, 6th, and 7th books of Apollonius's Conics; in which he was assisted by John Alphonso Borelli, who added commentaries to them. He died at Rome in 1664.

ECCHYMOSIS, from *εκχύνω* to *pour out*, or from *ἐξ* out of, and *χυμός* juice. It is an effusion of humours from their respective vessels, under the integuments; or, as Paulus Aegineta says, "When the flesh is bruised by the violent collision of any object, and its small veins broken, the blood is gradually discharged from them." This blood, when collected under the skin, is called an *ecchymosis*, the skin in the mean time remaining entire; sometimes a tumor is formed by it, which is soft and livid, and generally without pain. If the quantity of blood is not considerable, it is usually resorbed; if much, it suppurates: it rarely happens

Ecatom-
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Ecclesiasti-
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that any further inconvenience follows; though, in case of a very bad habit of body, a mortification may be the result, and in such a case regard must be had thereto.

ECCLAIRCISSEMENT. See ESCLAIRCISSEMENT.

ECCLESIASTES, a canonical book of the Old Testament, the design of which is to show the vanity of all sublunary things.

It was composed by Solomon; who enumerates the several objects on which men place their happiness, and then shows the insufficiency of all worldly enjoyments.

The Talmudists made king Hezekiah to be the author of it; Grotius ascribes it to Zorobabel, and others to Isaiah; but the generality of commentators believe this book to be the produce of Solomon's repentance, after having experienced all the follies and pleasures of life.

ECCLESIASTICAL, an appellation given to whatever belongs to the church: thus we say, ecclesiastical polity, jurisdiction, history, &c.

Blackst.
Comment.

ECCLESIASTICAL Courts. In the time of the Anglo-Saxons there was no sort of distinction between the lay and the ecclesiastical jurisdiction: the county-court was as much a spiritual as a temporal tribunal: the rights of the church were ascertained and asserted at the same time, and by the same judges, as the rights of the laity. For this purpose the bishop of the diocese, and the alderman, or in his absence the sheriff of the county, used to sit together in the county-court, and had there the cognizance of all causes as well ecclesiastical as civil; a superior deference being paid to the bishop's opinion in spiritual matters, and to that of the lay-judges in temporal. This union of power was very advantageous to them both: the presence of the bishop added weight and reverence to the sheriff's proceedings; and the authority of the sheriff was equally useful to the bishop, by enforcing obedience to his decrees in such refractory offenders as would otherwise have despised the thunder of mere ecclesiastical censures.

But so moderate and rational a plan was wholly inconsistent with those views of ambition that were then forming by the court of Rome. It soon became an established maxim in the papal system of policy, that all ecclesiastical persons, and all ecclesiastical causes, should be solely and entirely subject to ecclesiastical jurisdiction only: which jurisdiction was supposed to be lodged in the first place and immediately in the Pope, by divine indefeasible right and investiture from Christ himself, and derived from the Pope to all inferior tribunals. Hence the canon law lays it down as a rule, that "*sacerdotes a regibus honorandi sunt, non judicandi*"; and places an emphatical reliance on a fabulous tale which it tells of the emperor Constantine, That when some petitions were brought to him, imploring the aid of his authority against certain of his bishops accused of oppression and injustice, he caused (says the holy canon) the petitions to be burnt in their presence, dismissing them with this valediction: "*Ite, et inter vos causas vestras discutite, quia dignum non est ut nos judicemus Deos.*"

It was not, however, till after the Norman conquest, that this doctrine was received in England; when Wil-

liam I. (whose title was warmly espoused by the monasteries which he liberally endowed, and by the foreign clergy whom he brought over in shoals from France and Italy, and planted in the best preferments of the English church), was at length prevailed upon to establish this fatal encroachment, and separate the ecclesiastical court from the civil: whether actuated by principles of bigotry, or by those of a more refined policy, in order to discountenance the laws of king Edward abounding with the spirit of Saxon liberty, is not altogether certain. But the latter, if not the cause, was undoubtedly the consequence, of this separation: for the Saxon laws were soon overborne by the Norman justiciaries, when the county-court fell into disregard by the bishop's withdrawing his presence, in obedience to the charter of the conqueror; which prohibited any spiritual cause from being tried in the secular courts, and commanded the suitors to appear before the bishop only, whose decisions were directed to conform to the canon law.

King Henry I. at his accession, among other restorations of the laws of king Edward the Confessor, revived this of the union of the civil and ecclesiastical courts. Which was, according to Sir Edward Coke, after the great heat of the conquest was past, only a restitution of the ancient law of England. This however was ill relished by the Popish clergy, who, under the guidance of that arrogant prelate archbishop Anselm, very early disapproved of a measure that put them on a level with the profane laity, and subjected spiritual men and causes to the inspection of the secular magistrates: and therefore, in their synod at Westminster, 3 Hen. I. they ordained, that no bishop should attend the discussion of temporal causes; which soon dissolved this newly effected union. And when, upon the death of king Henry I. the usurper Stephen was brought in and supported by the clergy, we find one article of the oath which they imposed upon him was, that ecclesiastical persons and ecclesiastical causes should be subject only to the bishop's jurisdiction. And as it was about that time that the contest and emulation began between the laws of England and those of Rome, the temporal courts adhering to the former, and the spiritual adopting the latter, as their rule of proceeding; this widened the breach between them, and made a coalition afterwards impracticable; which probably would else have been effected at the general reformation of the church.

Ecclesiastical Courts are various; as the ARCHDEACON'S, the CONSISTORY, the COURT OF ARCHES, the PECULIARS, the PREROGATIVE, and the great court of appeal in all ecclesiastical causes, viz. the COURT OF DELEGATES. See these articles.

As to the method of proceeding in the spiritual courts, it must (in the first place) be acknowledged to their honour, that though they continue to this day to decide many questions which are properly of temporal cognizance, yet justice is in general so ably and impartially administered in those tribunals (especially of the superior kind), and the boundaries of their power are now so well known and established, that no material inconvenience at present arises from this jurisdiction still continuing in the ancient channel. And, should any alteration be attempted, great confusion would probably arise, in overturning long established forms,

Blackst.
Comment.

Ecclesiastical Courts. forms, and new-modelling a course of proceedings that has now prevailed for seven centuries.

The establishment of the civil-law process in all the ecclesiastical courts was indeed a master-piece of papal discernment, as it made a coalition impracticable between them and the national tribunals, without manifest inconvenience and hazard. And this consideration had undoubtedly its weight in causing this measure to be adopted, though many other causes concurred. In particular, it may be here remarked, that the pandects, or collections of civil law, being written in the Latin tongue, and referring so much to the will of the prince and his delegated officers of justice, sufficiently recommended them to the court of Rome, exclusive of their intrinsic merit. To keep the laity in the darkest ignorance, and to monopolize the little science which then existed entirely among the monkish clergy, were deep-rooted principles of papal policy. And as the bishops of Rome affected in all points to mimic the imperial grandeur, as the spiritual prerogatives were moulded on the pattern of the temporal, so the canon-law process was formed on the model of the civil law; the prelates embracing, with the utmost ardor, a method of judicial proceedings, which was carried on in a language unknown to the bulk of the people, which banished the intervention of a jury (that bulwark of Gothic liberty), and which placed an arbitrary power of decision in the breast of a single man.

The proceedings in the ecclesiastical courts are therefore regulated according to the practice of the civil and canon laws; or rather to a mixture of both, corrected and new-modelled by their own particular usages, and the interposition of the courts of common law. For, if the proceedings in the spiritual court be ever so regularly consonant to the rules of the Roman law, yet if they be manifestly repugnant to the fundamental maxims of the municipal laws, to which, upon principles of sound policy, the ecclesiastical process ought in every state to conform (as if they require two witnesses to prove a fact, where one will suffice at common law); in such cases, a prohibition will be awarded against them. But, under these restrictions, their ordinary course of proceeding is, first, by *citation*, to call the party injuring before them. Then by *libel* (*libellus*, "a little book"), or by articles drawn out in a formal *allegation*, to set forth the complainant's ground of complaint. To this succeeds the *defendant's answer* upon oath; when, if he denies or extenuates the charge, they proceed to *proofs* by witnesses examined, and their depositions taken down in writing by an officer of the court. If the defendant has any circumstances to offer in his defence, he must also propound them in what is called his *defensive allegation*, to which he is intitled in his turn to the *plaintiff's answer* upon oath, and may from thence proceed to *proofs* as well as his antagonist. The canonical doctrine of *purgation*, whereby the parties were obliged to answer upon oath to any matter, however criminal, that might be objected against them (though long ago over-ruled in the court of chancery, the genius of the English law having broken through the bondage imposed on it by its clerical chancellors, and asserted the doctrines of judicial as well as civil liberty), continued till the middle of the last century, to be upheld by the spiritual courts; when the legislature was obliged to interpose, to teach them

a lesson of similar moderation. By the statute of 13 Car. II. c. 12. it is enacted, that it shall not be lawful for any bishop, or ecclesiastical judge, to tender or administer to any person whatsoever, the oath usually called the oath *ex officio*, or any other oath whereby he may be compelled to confess, accuse, or purge himself of any criminal matter or thing, whereby he may be liable to any censure or punishment. When all the pleadings and proofs are concluded, they are referred to the consideration, not of a jury, but of a single judge; who *takes information* by hearing advocates on both sides, and thereupon forms his *interlocutory decree* or *definitive sentence*, at his own discretion: from which there generally lies an *appeal*, in the several stages mentioned in the articles above referred to; though if the same be not appealed from him in 15 days, it is final, by the statute 25 Hen. VIII. c. 19.

But the point in which these jurisdictions are the most defective, is that of enforcing their sentences when pronounced; for which they have no other process but that of *excommunication*; which would be often despised by obstinate or profligate men, did not the civil law step in with its aid. See EXCOMMUNICATION.

ECCLESIASTICAL Corporations, are where the members that compose them are *spiritual* persons. They were erected for the furtherance of religion and perpetuating the rights of the church. See CORPORATIONS.

ECCLESIASTICAL State. See CLERGY.

ECCLESIASTICUS, an apocryphal book, generally bound up with the scriptures, so called, from its being read in the church, *ecclesia*, as a book of piety and instruction, but not of infallible authority.

The author of this book was a Jew, called *Jesus the son of Sirach*. The Greeks call it the *Wisdom of the son of Sirach*.

ECCOPROTICS, in medicine, laxative or loosening remedies, which purge gently, by softening the humours and excrements, and fitting them for expulsion.—The word is composed of the Greek particle *ex*, and *κοπρος* excrement.

ECDICI, *Εκδικοί*, among the ancients, patrons of cities, who defended their rights, and took care of the public money. Their office resembled that of the modern syndics.

ECHAPE, in the manege, a horse begot between a stallion and a mare of different breeds and countries.

ECHAPER, in the manege, a gallicism used in the academies implying to give a horse head, or to put on at full speed.

ECHENEIS, the REMORA, in ichthyology; a genus belonging to the order of thoracici. The head is fat, naked, depressed, and marked with a number of transverse ridges; it has ten rays in the branchiostegic membrane; and the body is naked. There are two species, viz. 1. The remora, or sucking-fish, with a forked tail, and 18 strizæ on the head. It is found in the Indian ocean. 2. The neurates, with an undivided tail, and 16 strizæ on the head. It is likewise a native of the Indian ocean. These fishes are often found adhering so strongly to the sides of sharks and other great fish, by means of the structure of its head, as to be got off with difficulty. This fish was believed, by all the ancients, to have most wonderful powers, and to be able, by adhering to the bottom, to arrest the

Plate CLXXIII.

Echevin the motion of a ship in its fullest course; and in love affairs, to deaden the warmest affections of both sexes (*Plin. lib. ix. c. 25.*)

Echinus.

ECHEVIN, in the French and Dutch polity, a magistrate elected by the inhabitants of a city or town, to take care of their common concerns, and the decoration and cleanliness of the city.

At Paris, there is a prévôt and four echevins; in other towns, a mayor and echevins. At Amsterdam, there are nine echevins; and at Rotterdam, seven.

In France, the echevins take cognizance of rents, taxes, and the navigation of rivers, &c. In Holland, they judge of civil and criminal causes; and if the criminal confesses himself guilty, they can see their sentence executed without appeal.

ECHINATE, or **ECHINATED**, an appellation given to whatever is prickly, thereby resembling the hedgehog.

ECHINITES, in natural history, the name by which authors call the fossile centronia, frequently found in our chalk-pits. See **CENTRONIA**.

ECHINOPHORA, in botany: A genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order, *Umbellata*. The male florets are lateral, with the central one hermaphrodite; there is one seed, sunk into an indurated involucre.

ECHINOPS, in botany: A genus of the polygamia segregata order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Composita*. The calyx is unisporous; the corollulae tubulated, and hermaphrodite; the receptacle bristly; the pappus indistinct.

ECHINUS, in zoology, a genus of insects belonging to the order of vermes mollusca. The body is roundish, covered with a bony crust, and often beset with moveable prickles; and the mouth is below, and consists of five valves. 1. The esculentus, or eatable echinus, is of a hemispherical form, covered with sharp strong spines, above half an inch long; commonly of a violet colour; moveable; adherent to small tubercles elegantly disposed in rows. These are their instruments of motion by which they change their place. This species is taken in dredging, and often lodges in cavities of rocks just within low water mark. They are eaten by the poor in many parts of England, and by the better sort abroad. In old times they were a favourite dish. They were dressed with vinegar, honied wine or mead, parsley or mint; and thought to agree with the stomach. They were the first dish in the famous supper of Lentulus, when he was made *flamen Martialis*, or priest of Mars. By some of the concomitant dishes, they seem to have been designed as a whet for the second course, to the holy personages, priests and vestals invited on that occasion. Many species of shell-fish made part of that entertainment. 2. The lacunofus, or oval echinus, is of an oval depressed form; on the top it is of a purple colour, marked with a quadrefoil, and the spaces between tuberculated in waved rows; the lower side fluted, and divided by two smooth spaces. Length, four inches. When clothed, it is covered with short thickset bristles mixed with very long ones. There are 15 other species, all natives of the sea. See two specimens delineated on Plate CLXXIII.

ECHINUS, in architecture, a member or ornament near the bottom of the Ionic, Corinthian, and Composite capitals.

ECHITES, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 30th order, *Contorta*. There are two long and straight follicles; the seeds pappous; the corolla funnel-shaped, with the throat naked. The corymbosa, a species of this genus, is supposed to yield the elastic gum according to Jaquin. See **CAOUTCHOUC**.

ECHIUM, **VIPER'S BUGLOSS**, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 41st order, *Asperifolia*. The corolla is irregular, with the throat naked. There are seven species, three of which are natives of Britain. None of them have any remarkable property, except that the flowers of one species (the vulgare) are very grateful to bees. It is a native of many parts of Britain. The stem is rough with hairs and tubercles. The leaves are spear-shaped, and rough with hair. The flowers come out in lateral spikes. They are first red, afterwards blue; sometimes purple or white.—Cows and sheep are not fond of the plant; horses and goats refuse it.

ECHO, or **ECCHO**, a sound reflected or reverberated, from a solid, concave, body, and so repeated to the ear*. The word is formed from the Greek *ἠχώ* * See *Acoustics*, n° 26. *sonus*, which comes from the verb *ἠέω* *sono*.

The ancients being wholly unacquainted with the true cause of the echo, ascribed it to several causes sufficiently whimsical. The poets, who were not the worst of their philosophers, imagined it to be a person of that name metamorphosed, and that she affected to take up her abode in particular places; for they found by experience, that she was not to be met with in all. (See below, **ECHO** in *fabulous history*.) But the moderns, who know sound to consist in a certain tremor or vibration in the sonorous body communicated to the contiguous air, and by that means to the ear, give a more consistent account of echo.

For a tremulous body, striking on another solid body, it is evident, may be repelled without destroying or diminishing its tremor; and consequently a sound may be redoubled by the resiliency of the tremulous body, or air.

But a simple reflexion of the sonorous air, is not enough to solve the echo: for then every plain surface of a solid hard body, as being fit to reflect a voice or sound, would redouble it; which we find does not hold.

To produce an echo, therefore, it should seem that a kind of concameration or vaulting were necessary, in order to collect, and by collecting to heighten and increase, and afterwards reflect, the sound; as we find is the case in reflecting the rays of light, where a concave mirror is required.

In effect, as often as a sound strikes perpendicularly on a wall, behind which is any thing of a vault or arch, or even another parallel wall; so often will it be reverberated in the same line, or other adjacent ones.

For an echo to be heard, therefore, it is necessary the ear be in the line of reflection: for the person who made the sound to hear its echo, it is necessary he be

Echo. perpendicular to the place which reflects it: and for a manifold or tautological echo, it is necessary there be a number of walls, and vaults or cavities, either placed behind or fronting each other.

A single arch or concavity, &c. can scarce ever stop and reflect all the sound; but if there be a convenient disposition behind it, part of the sound propagated thither, being collected and reflected as before, will present another echo: or, if there be another concavity, opposed at a due distance to the former, the sound reflected from the one upon the other will be tossed back again by this latter, &c.

Many of the phenomena of echos are well considered by the bishop of Leighs, &c. who remarks, that any sound, falling either directly or obliquely on any dense body of a smooth, whether plain or arched, superficies, is reflected, or echoes, more or less. The surface, says he, must be smooth; otherwise the air, by reverberation, will be put out of its regular motion, and the sound thereby broken and extinguished. He adds, that it echoes more or less, to show, that when all things are as before described, there is still an echoing, tho' it be not always heard; either because the direct sound is too weak to beat quite back again to him that made it; or that it does return to him, but so weak, that it cannot be discerned; or that he stands in a wrong place to receive the reflected sound, which passes over his head, under his feet, or on one side of him; and which therefore may be heard by a man standing in the place where the reflected sound does come, provided no interposed body intercepts it, but not by him that first made it.

Echos may be produced with different circumstances. For, 1. A *plane* obstacle reflects the sound back in its due tone and loudness; allowance being made for the proportionable decrease of the sound, according to its distance.

2. A *convex* obstacle reflects the sound somewhat smaller and somewhat quicker, though weaker, than otherwise it would be.

3. A *concave* obstacle echoes back the sound, bigger, slower, and also inverted; but never according to the order of words.

Nor does it seem possible to contrive any single echo, that shall invert the sound, and repeat backwards; because, in such case, the word last spoken, that is, which last occurs to the obstacle, must be repelled first; which cannot be. For where in the mean time should the first words hang and be concealed; or how, after such a pause, be revived, and animated again into motion?

From the determinate concavity or archedness of the reflecting bodies, it may happen that some of them shall only echo back one determinate note, and only from one place.

4. The echoing body being removed farther off, it reflects more of the sound than when nearer; which is the reason why some echoes repeat but one syllable, some one word, and some many.

5. Echoing bodies may be so contrived and placed, as that reflecting the sound from one to the other, either directly and mutually, or obliquely and by succession, out of one sound, a multiple echo or many echoes shall arise.

Add, that a multiple echo may be made, by so placing the echoing bodies at unequal distances, that

they may reflect all one way, and not one on the other; by which means, a manifold successive sound will be heard; one clap of the hands, like many; one *ha*, like a laughter; one single word, like many of the same tone and accent; and so one viol, like many of the same kind, imitating each other.

Lastly, echoing bodies may be so ordered, that from any one sound given, they shall produce many echoes different both as to tone and intention. By which means a musical room may be so contrived, that not only one instrument playing therein shall seem many of the same sort and size, but even a concert of different ones, only by placing certain echoing bodies so, that any note played shall be returned by them in 3ds, 5ths, and 8ths.

ECHO, is also used for the place where the repetition of the sound is produced or heard.

Echos are distinguished into divers kinds, viz.

1. *Single*, which return the voice but once. Whereof some are *tonical*, which only return a voice when modulated into some particular musical tone: Others, *polysyllabical*, which return many syllables, words, and sentences. Of this last kind is that fine echo in Woodstock-park, which Dr Plot assures us, in the day-time, will return very distinctly seventeen syllables, and in the night twenty.

2. *Multiple*, or *tautological*; which return syllables and words the same oftentimes repeated.

In echos, the place where the speaker stands is called the *centrum phonicum*; and the object or place that returns the voice, the *centrum phonocampticum*.

At the sepulchre of Metella, wife of Crassus, was an echo, which repeated what a man said five times. Authors mention a tower at Cyzicus, where the echo repeated seven times. One of the finest echos we read of is that mentioned by Barthius, in his notes on Statius's *Thebais*, lib. vi. 30. which repeated the words a man uttered 17 times: it was on the banks of the Naha, between Coblenz and Bingen. Barthius assures us, he had proved what he writes; and had told 17 repetitions. And whereas, in common echos, the repetition is not heard till some time after hearing the word spoke, or the notes sung; in this, the person who speaks or sings is scarce heard at all; but the repetition most clearly, and always in surprising varieties; the echo seeming sometimes to approach nearer, and sometimes to be further off. Sometimes the voice is heard very distinctly, and sometimes scarce at all. One hears only one voice, and another several: one hears the echo on the right, and the other on the left, &c. At Milan in Italy, is an echo which reiterates the report of a pistol 56 times; and if the report is very loud, upwards of 60 reiterations may be counted. The first 20 echos are pretty distinct; but as the noise seems to fly away, and answer at a greater distance, the reiterations are so doubled, that they can scarce be counted. See an account of a remarkable echo under the article **PAISLEY**.

ECHO, in architecture, a term applied to certain kinds of vaults and arches, most commonly of the elliptic and parabolic figures, used to redouble sounds, and produce artificial echos.

ECHO, in poetry, a kind of composition wherein the last words or syllables of each verse contains some meaning, which, being repeated apart, answers to some question.

Echo
Eclectics.

tion or other matter contained in the verse; as in this beautiful one from Virgil:

*Crudelis mater magis, an puer improbus ille?
Improbis ille puer, crudelis tu quoque mater.*

The elegance of an echo consists in giving a new sense to the last words; which reverberate, as it were, the motions of the mind, and by that means affect it with surprise and admiration.

ECHO, in fabulous history, a daughter of the Air and Tellus, who chiefly resided in the vicinity of the Cephissus. She was once one of Juno's attendants, and became the confident of Jupiter's amours. Her loquacity however displeased Jupiter, and she was deprived of the power of speech by Juno, and only permitted to answer to the questions which were put to her. Pan had formerly been one of her admirers, but he never enjoyed her favours. Echo, after she had been punished by Juno, fell in love with Narcissus; but being despised by him, pined herself to death, having nothing but her voice left.

ECHOMETER, among musicians, a kind of scale or rule, with several lines thereon, serving to measure the duration and length of sounds, and to find their intervals and ratios.

ECHOUERIES. See under TRICHECUS.

ECKIUS (John), an eminent and learned divine, professor in the university of Ingoldstadt, memorable for the opposition he gave to Luther, Melancthon, Carlostadius, and other leading Protestants in Germany. He wrote many polemical tracts; and among the rest, a *Manual of Controversies*, printed in 1535, in which he discourses upon most of the heads contested between the Protestants and Papists. He was a man of uncommon learning, parts, and zeal, and died in 1543.

ELECTICS (*eclectici*), a name given to some ancient philosophers, who, without attaching themselves to any particular sect, took what they judged good, and solid, from each. Hence their denomination; which, in the original Greek, signifies, "that may be chosen," or "that chooses;" of the verb *εκλεγω* I choose.—Laertius notes, that they were also, for the same reason, denominated *analogetici*; but that they call themselves *Philalethes*, i. e. lovers of truth.

The chief or founder of the *eclectici* was one Potamon of Alexandria, who lived under Augustus and Tiberius; and who, weary of doubting of all things with the Sceptics and Pyrrhonians, formed the eclectic sect; which Vossius calls the *eclective*.

Towards the close of the second century a sect arose in the Christian church under the denomination of *Eclectics*, or modern *Platonics*. They professed to make truth the only object of their enquiry, and to be ready to adopt from all the different systems and sects, such tenets as they thought agreeable to it. However, they preferred Plato to the other philosophers, and looked upon his opinions concerning God, the human soul, and things invisible, as conformable to the spirit and genius of the Christian doctrine. One of the principal patrons of this system was Ammonius Saccas, who at this time laid the foundation of that sect, afterwards distinguished by the name of the new *Platonics*, in the Alexandrian school. See AMMONIUS and PLATONISTS.

N° 108.

ECLECTICS were also a certain set of physicians among the ancients, of whom Archigenes, under Trajan, was the chief, who selected from the opinions of all the other sects, that which appeared to them best and most rational; hence they were called *eclectics*, and their prescriptions *medicina eclectica*.

ECLIPSE, in astronomy, the deprivation of the light of the sun, or of some heavenly body, by the interposition of another heavenly body between our sight and it. See ASTRONOMY-Index.

ECLIPTA, in botany; a genus of the polygamia superflua order, belonging to the syngenesia class of plants. The receptacle is chaffy; there is no pappus, and the corollulæ of the disk quadrifid.

ECLIPTIC, in astronomy, a great circle of the sphere, supposed to be drawn through the middle of the zodiac, making an angle with the equinoctial of about 23° 30', which is the sun's greatest declination; or, more strictly speaking, it is that path or way among the fixed stars, that the earth appears to describe to an eye placed in the sun. See ASTRONOMY-Index.

Some call it *via Solis*, "the way of the sun;" because the sun in his apparent annual motion never deviates from it, as all the other planets do more or less.

ECLIPTIC, in geography, a great circle on the terrestrial globe, not only answering to, but falling within, the plane of the celestial ecliptic. See GEOGRAPHY.

ECLOGUE, in poetry, a kind of pastoral composition, wherein shepherds are introduced conversing together. The word is formed from the Greek *εκλογη* choice; so that, according to the etymology, *eclogue* should be no more than a select or choice piece; but custom has determined it to a farther signification, viz. a little elegant composition in a simple natural style and manner.

Idyllion and eclogue, in their primary intention, are the same thing: thus, the idyllia, *ιδυλλια*, of Theocritus, are pieces wrote perfectly in the same vein with the *eclogæ* of Virgil. But custom has made a difference between them, and appropriated the name *eclogue* to pieces wherein shepherds are introduced speaking; *idyllion*, to those wrote like the eclogue, in a simple natural style, but without any shepherds in them.

ECLUSE, a small but strong town of the Dutch Low Countries, in the county of Flanders, with a good harbour and sluices. The English besieged it in vain in 1405, and the people of Bruges in 1436. But the Dutch, commanded by Count Maurice of Nassau, took it in 1644. It is defended by several forts, and stands near the sea. E. Long. 3. 10. N. Lat. 50. 25.

ECPHRACTICS, in medicine, remedies which attenuate and remove obstructions. See ATTENUANTS, and DEOBSTRUENTS.

ECSTASY. See EXTASY.

ECSTATICI, *Εκστατικοί*, from *εξιστημι* I am entranced, in antiquity, a kind of diviners who were cast into trances or ecstasies, in which they lay like dead men, or asleep, deprived of all sense and motion; but, after some time, returning to themselves, gave strange relations of what they had seen and heard.

ECTHESIS, in church-history, a confession of faith, in the form of an edict, published in the year 639, by the emperor Heraclius, with a view to pacify the troubles occasioned by the Eutychian heresy in the eastern church. However, the same prince revoked it,

on

Eclectics
||
Ecthesis.

Ecthlipsis
||
Edda.

on being informed that pope Severinus had condemned it, as favouring the Monothelites; declaring at the same time, that Sergius, patriarch of Constantinople, was the author of it.

ECTHLIPSIS, among Latin grammarians, a figure of prosody whereby the *m* at the end of a word, when the following word begins with a vowel, is elided, or cut off, together with the vowel preceding it, for the sake of the measure of the verse: thus they read *mult' ille*, or *multum ille*.

ECTROPIUM, in surgery, is when the eye-lids are inverted, or retracted, so that they show their internal or red surface, and cannot sufficiently cover the eye.

ECTYLOTICS, in pharmacy, remedies proper for consuming callosities.

ECU, or ESCU, a French crown; for the value of which, see MONEY.

EDDA, in antiquities, is a system of the ancient Icelandic or Runic mythology, containing many curious particulars of the theology, philosophy, and manners, of the northern nations of Europe; or of the Scandinavians, who had migrated from Asia, and from whom our Saxon ancestors were descended. Mr Mallet apprehends that it was originally compiled, soon after the Pagan religion was abolished, as a course of poetical lectures, for the use of such young Icelanders as devoted themselves to the profession of a *scald* or poet. It consists of two principal parts; the first containing a brief system of mythology, properly called the *Edda*; and the second being a kind of art of poetry, and called *scalda* or *poetics*. The most ancient Edda was compiled by Soemund Sigfussion, surnamed the *Learned*, who was born in Iceland about the year 1057. This was abridged, and rendered more easy and intelligible about 120 years afterwards, by Snorro Sturleson, who was supreme judge of Iceland in the years 1215 and 1222; and it was published in the form of a dialogue. He added also the second part in the form of a dialogue, being a detail of different events transacted among the divinities. The only three pieces that are known to remain of the more ancient Edda of Soemund, are the *Voluspa*, the *Havamaal*, and the *Runic chapter*. The *Voluspa*, or prophecy of *Vola* or *Fola*, appears to be the text, on which the *Edda* is the comment. It contains in two or three hundred lines the whole system of mythology, disclosed in the *Edda*, and may be compared to the Sibylline verses, on account of its laconic yet bold style, and its imagery and obscurity. It is professedly a revelation of the decrees of the Father of nature, and the actions and operations of the gods. It describes the chaos, the formation of the world, with its various inhabitants, the function of the gods, their most signal adventures, their quarrels with *Loke* their great adversary, and the vengeance that ensued; and concludes with a long description of the final state of the universe, its dissolution and conflagration, the battle of the inferior deities, and the evil beings, the renovation of the world, the happy lot of the good, and the punishment of the wicked. The *Havamaal*, or *Sublime Discourse*, is attributed to the god *Odin*, who is supposed to have given these precepts of wisdom to mankind; it is comprised in about 120 stanzas, and resembles the book of Proverbs. Mr Mallet has given

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veral extracts of this treatise on the Scandinavian ethics. The Runic chapter contains a short system of ancient magic, and especially of the enchantments wrought by the operation of Runic characters, of which Mr Mallet has also given a specimen. A manuscript copy of the *Edda* of Snorro is preserved in the library of the university of Upsal; the first part of which hath been published with a Swedish and Latin version by M. Goranson. The Latin version is printed as a supplement to M. Mallet's *Northern Antiquities*. The first edition of the *Edda* was published by Resenius, professor at Copenhagen, in a large quarto volume, in the year 1665; containing the text of the *Edda*, a Latin translation by an Icelandic priest, a Danish version, and various readings from different MSS. M. Mallet has also given an English translation of the first part, accompanied with remarks; from which we learn, that the *Edda* teaches the doctrine of the Supreme, called the *Universal Father*, and *Odin*, who lives for ever, governs all his kingdom, and directs the great things as well as the small; who formed the heaven, earth, and air; made man, and gave him a spirit or soul, which shall live, after the body shall have mouldered away; and then all the just shall dwell with him in a place *Gimle* or *Vingolf*, the palace of friendship; but wicked men shall go to *Hela*, or death, and from thence to *Nifheim*, or the abode of the wicked, which is below in the ninth world. It inculcates also the belief of several inferior gods and goddesses, the chief of whom is *Frigga* or *Frea*, i. e. *lady*, meaning hereby the earth, who was the spouse of *Odin* or the Supreme God; whence we may infer that, according to the opinion of these ancient philosophers, this *Odin* was the active principle or soul of the world, which uniting itself with matter, had thereby put it into a condition to produce the intelligences or inferior gods, and men and all other creatures. The *Edda* likewise teaches the existence of an evil being called *Loke*, the calumniator of the gods, the artificer of fraud, who surpasses all other beings in cunning and perfidy. It teaches the creation of all things out of an abyss or chaos; the final destruction of the world by fire; the absorption of the inferior divinities, both good and bad, into the bosom of the grand divinity, from whom all things proceeded, as emanations of his essence, and who will survive all things; and the renovation of the earth in an improved state.

EDDISH, or EADISH, the latter pasture or grass that comes after mowing or reaping; otherwise called *eagrass* or *earsh*, and *etch*.

EDDOES or EDDERS, in botany; the American name of the *Arum esculentum*.

EDDY (Saxon), of *ed* "backward," and *ea* "water," among seamen, is where the water runs back contrary to the tide; or that which hinders the free passage of the stream, and so causes it to return again. That eddy water which falls back, as it were, on the rudder of a ship under sail, the seamen call the *dead water*.

EDDY-Wind is that which returns or is beat back from a sail, mountain, or any thing that may hinder its passage.

EDELINCK (Gerard), a famous engraver, born at Antwerp, where he was instructed in drawing and engraving.

Edda
||
Edelinck.

Edelinck.
||
Edgings.

engraving. He settled at Paris, in the reign of Louis XIV. who made him his engraver in ordinary. Edelinck was also counsellor in the Royal Academy of Painting. His works are particularly esteemed for the neatness of the engraving, their brilliant cast, and the prodigious ease apparent in the execution; and to this facility is owing the great number of plates we have of his; among which are excellent portraits of a great number of illustrious men of his time. Among the most admired of his prints, the following may be specified as holding the chief place. 1. A Battle between four Horsemen, with three figures lying slain upon the ground, from Leonardo da Vinci. 2. A holy Family, with Elizabeth, St John, and two Angels, from the famous picture of Raphael in the king of France's collection. The first impressions are before the arms of M. Colbert were added at the bottom of the plate; the second are with the arms; and in the third the arms are taken out, but the place where they had been inserted is very perceptible. 3. Mary Magdalen bewailing her sins, and trampling upon the riches of the world, from Le Brun. The first impressions are without the narrow border which surrounds the print. 4. Alexander entering into the Tent of Darius, a large print on two plates, from Le Brun. This engraving belongs to the three battles, and triumphal entry of Alexander into Babylon, by Girard Audran, and completes the set. The first impressions have the name of *Goyton* the printer at the bottom. 5. Alexander entering into the Tent of Darius (finished by P. Drevet), from Peter Mignard. Edelinck died in 1707, in an advanced age, at the Hotel Royal at the Gobelins, where he had an apartment. He had a brother named *John*, who was a skilful engraver, but died young.

EDEN (Moses), the name of a country, with a garden, in which the progenitors of mankind were settled by God himself: The term denotes pleasure or delight. It would be endless to recount the several opinions concerning its situation, some of them very wild and extravagant. Moses says, that "a river went out of Eden to water the garden, and from thence it was parted and became into four heads." This river is supposed to be the common channel of the Euphrates and Tigris, after their confluence; which parted again, below the garden, into two different channels: so that the two channels before, and the other two after their confluence, constitute the heads mentioned by Moses. Which will determine the situation of the garden to have been in the south of Mesopotamia, or in Babylonia. The garden was also called *Paradise*; a term of Persian original, denoting a garden. See PARADISE.

EDGINGS, in gardening, the series of small but durable plants, set round the edges or borders of flower-beds, &c. The best and most durable of all plants for this use, is box; which, if well planted, and rightly managed, will continue in strength and beauty for many years. The seasons for planting this, are the autumn, and very early in the spring: and the best species for this purpose is the dwarf Dutch box.

Formerly, it was also a very common practice to plant borders, or edgings, of aromatic herbs; as thyme,

savory, hyssop, lavender, and the like: but these are all apt to grow woody, and to be in part, or wholly, destroyed in hard winters. Daisies, thrift, or sea july-flower, and camomile, are also used by some for this purpose: but they require yearly transplanting, and a great deal of trouble, else they grow out of form; and they are also subject to perish in very hard seasons.

EDHILING, EDHILINGUS, an ancient appellation of the nobility among the Anglo-Saxons.

The Saxon nation, says Nithard (Hist. lib. iv.) is divided into three orders or classes of people; the *edhilingi*, the *frilingi*, and the *lazzi*; which signify the nobility, the freemen, and the vassals or slaves.

Instead of *edhiling*, we sometimes meet with *atheling*, or *atheling*; which appellation was likewise given to the king's son, and the presumptive heir of the crown. See ATHELING.

EDICT, in matters of polity, an order or instrument, signed and sealed by a prince, to serve as a law to his subjects. We find frequent mention of the edicts of the prætor, the ordinances of that officer in the Roman law. In the French law, the edicts are of several kinds: some importing a new law or regulation; others, the erection of new offices; establishments of duties, rents, &c.; and sometimes articles of pacification. In France, edicts are much the same as a proclamation is with us: but with this difference, that the former have the authority of a law in themselves, from the power which issues them forth; whereas the latter are only declarations of a law, to which they refer, and have no power in themselves.

EDILE, or ÆDILE. See ÆDILE.

EDINBURGH, a city of Mid-Lothian in Scotland, situated in W. Long. 3°, and N. Lat. 56°, near the southern bank of the river Forth.—The origin of the name, like that of most other cities, is very uncertain. Some imagine it to be derived from *Eth*, a supposed king of the Picts; others from *Edwin*, a Saxon prince of Northumberland, who over-ran the whole or greatest part of the territories of the Picts about the year 617; while others choose to derive it from two Gaelic words *Dun Edin*, signifying the face of a hill. The name *Edinburgh* itself, however, seems to have been unknown in the time of the Romans. The most ancient title by which we find this city distinguished is that of *Castell Mynydd Agned*; which, in the British language, signifies "the fortrefs of the hill of St Agnes." Afterwards it was named *Castrum Puellarum*, because the Pictish princesses were educated in the castle (a necessary protection in those barbarous ages) till they were married.—The ages in which these names were given cannot indeed now be exactly ascertained: but the town certainly cannot boast of very great antiquity; since, as Mr Whittaker informs us, the celebrated King Arthur fought a battle on the spot where it is situated towards the end of the fifth century.

The Romans, during the time they held the dominion of part of this island, divided their possessions into six provinces. The most northerly of these was called *Valentia*, which comprehended all the space between the walls of ADRIAN and SEVERUS. Thus, Edinburgh, lying on the very out-skirts of that province which was most exposed to the ravages of the barbarians, became

per-

Edinburgh

perpetually subject to wars and devastations; by means of which, the time of its first foundation cannot now be guessed at.

The castle is certainly very ancient. It continued in the hands of the Saxons or English from the invasion of Oeta and Ebusa in the year 452 till the defeat of Egfrid king of Northumberland in 685 by the Picts, who then repossessed themselves of it. The Saxon kings of Northumberland reconquered it in the ninth century; and it was retained by their successors till the year 956, when it was given up to Indulphus king of Scotland. In 1093 it was unsuccessfully besieged by the usurper Donald Bane. Whether the city was at that time founded or not is uncertain. Most probably it was: for as protection from violence was necessary in those barbarous ages, the castle of Edinburgh could not fail of being an inducement to many people to settle in its neighbourhood; and thus the city would gradually be founded and increase.—In 1128, King David I. founded the Abbey of Holyroodhouse, for certain canons regular; and granted them a charter, in which he styled the town *Burgo meo de Edwinesburg*, “my borough of Edinburgh.” By the same charter he granted these canons 40 shillings yearly out of the town revenues; and likewise 48 shillings more, from the same, in case of the failure of certain duties payable from the king’s revenue; and likewise one half of the tallow, lard, and hides, of all the beasts killed in Edinburgh.

³
Castle sur-
rendered to
the English.

In 1174, the castle of Edinburgh was surrendered to Henry II. of England, in order to purchase the liberty of King William I. who had been defeated and taken prisoner by the English. But when William recovered his liberty, he entered into an alliance with Henry, and married his cousin Ermengarde; upon which the castle was restored as part of the queen’s dower.

In 1215, this city was first distinguished by having a parliament and provincial synod held in it.—In 1296, the castle was besieged and taken by Edward I. of England; but was recovered in 1313 by Randolph Earl of Moray, who was afterwards regent of Scotland during the minority of King David II. At last King Robert destroyed this fortress, as well as all others in Scotland, lest they should afford shelter to the English in any of their after incursions into Scotland.—It lay in ruins for a considerable number of years; but was afterwards rebuilt by Edward III. of England, who placed a strong garrison in it.

In 1341 it was reduced by the following stratagem. A man, pretending to be an English merchant, came to the governor, and told him that he had on board his ship in the Forth some wine, beer, biscuits, &c. which he would sell him on very reasonable terms. A bargain being made, he promised to deliver the goods next morning at a very reasonable rate: but at the time appointed, twelve men, disguised in the habit of sailors, entered the castle with the goods and supposed merchant; and having instantly killed the porter and centinels, Sir William Douglas, on a preconcerted signal, rushed in with a band of armed men, and quickly made himself master of the place, after having cut most of the garrison in pieces.

⁴
Cruel execution of
the murderers of
James I.

The year 1437 is remarkable for the execution of the Earl of Athol and his accomplices, who had a concern in the murder of James I. The crime, it must

be owned, was execrable; but the punishment was altogether shocking to humanity. For three days successively the assassins were tortured by putting on their heads iron crowns heated red hot, dislocating their joints, pinching their flesh with red hot pincers, and carrying them in that dreadful situation through the streets upon hurdles. At last an end was put to their sufferings, by cutting them up alive, and sending the parts of their mangled bodies to the principal towns of the kingdom.

About the end of the 14th century it was customary to consider Edinburgh as the capital of the kingdom. The town of Leith, with its harbour and mills, had been bestowed upon it by Robert I. in 1329; and his grandson John Earl of Carrick, who afterwards ascended the throne by the name of Robert III. conferred upon all the burghs the singular privilege of building houses in the castle, upon the sole condition that they should be persons of good fame; which we must undoubtedly consider as a proof that the number of these burghs was at that time very small. In 1461 a very considerable privilege was conferred on the city by Henry VI. of England when in a state of exile; viz. that its inhabitants should have liberty to trade to all the English ports on the same terms with the city of London. This extraordinary privilege was bestowed in consequence of the kindness with which that king was treated in a visit to the Scottish monarch at Edinburgh; but as Henry was never restored, his gratitude was not attended with any benefit to this city. From this time, however, its privileges continued to be increased from various causes. In 1482 the citizens had an opportunity of liberating King James from the oppression of his nobles, by whom he had been imprisoned in the castle. On this account the provost was by that monarch made hereditary high sheriff within the city, an office which he continues still to enjoy. The council at the same time were invested with the power of making laws and statutes for the government of the city; and the trades, as a testimony of the royal gratitude for their loyalty, received the banner known by the name of the *Blue Blanket*; an ensign formerly capable of producing great commotions, but which has not now been displayed for many years past. However, it still exists; and the convener of the trades has the charge of keeping it.

It was not long after the discovery of America that the venereal disease, imported from that country, made its way to Edinburgh. As early as 1497, only five years after the voyage of Columbus, we find it looked upon as a most dreadful plague; and the unhappy persons affected with it were separated as effectually as possible from society. The place of their exile was Inchkeith, a small island near the middle of the Forth; which, small as it is, has a spring of fresh water, and now affords pasture to some sheep.

By the overthrow of James IV. at the battle of Flowden, the city of Edinburgh was overwhelmed with grief and confusion, that monarch having been attended in his unfortunate expedition by the Earl of Angus, then provost, with the rest of the magistrates, and a number of the principal inhabitants, most of whom perished in the battle. After this disaster, the inhabitants being alarmed for the safety of their city,

Edinburgh.

⁵
Edinburgh
becomes the
capital of
Scotland.

6

Venereal
the venereal disease, imported from that country, made its way to Edinburgh. As early as 1497, only five years after the voyage of Columbus, we find it looked upon as a most dreadful plague; and the unhappy persons affected with it were separated as effectually as possible from society. The place of their exile was Inchkeith, a small island near the middle of the Forth; which, small as it is, has a spring of fresh water, and now affords pasture to some sheep.

⁷
Origin of
the town-
guard.

Edinburgh it was enacted that every fourth man should keep watch at night; the fortifications of the town were renewed, the wall being also extended in such a manner as to inclose the Grassmarket, and the field on which Heriot's Hospital, the Grey Friars Church, and Charity Workhouse, stand. On the east side it was made to inclose the College, Infirmary, and High School; after which, turning to the north, it met the old wall at the Netherbow-port. After this alarm was over, the inhabitants were gradually relieved from the trouble of watching at night, and a certain number of militia appointed to prevent disturbances; who continue to this day, and are known by the name of the *Town Guard*. Before these new inclosures, most of the principal people lived in the Cowgate without the wall; and the burying-place was situated where the Parliament Close now is. In our days of peace, when no alarm of an enemy is at all probable, great part of the walls, with all the gates, have been taken down, and the city laid quite open, in order to afford more ready passage to the great concourse of people with whom the street is daily filled. But at the period we speak of, not only were the inhabitants much less numerous by reason of the small extent of the city, but it was depopulated by a dreadful plague; so that, to stop if possible the progress of the infection, all houses and shops were shut up for 14 days, and some where infected persons had died were pulled down altogether.

8
Erection of
wooden
houses.

In 1504, the tract of ground called the *Burrough Muir* was totally overgrown with wood, though now it affords not the smallest vestige of having been in such a state. So great was the quantity at that time, however, that it was enacted by the town-council, that whoever inclined to purchase as much wood as was sufficient to make a new front for their house, might extend it seven feet into the street. Thus the city was in a short time filled with houses of wood instead of stone; by which, besides the inconvenience of having the street narrowed 14 feet, and the beauty of the whole entirely marred, it became much more liable to accidents by fire: but almost all these are now pulled down; and in doing this a singular taste in the masonry which supported them is said to have been discovered.

9
Edinburgh
destroyed
by the Eng-
lish.

In 1542, a war with England having commenced through the treachery of Cardinal Beaton, an English fleet of 200 sail entered the Forth; and having landed their forces, quickly made themselves masters of the towns of Leith and Edinburgh. They next attacked the castle, but were repulsed from it with loss; and by this they were so enraged, that they not only destroyed the towns of Edinburgh and Leith, but laid waste the country for a great way round.—These towns, however, speedily recovered from their ruinous state; and, in 1547, Leith was again burned by the English after the battle of Pinkie, but Edinburgh was spared.

Several disturbances happened in this capital at the time of the Reformation, of which an account is given under the article SCOTLAND; but none of these greatly affected the city till the year 1570, at which time there was a civil war on account of Q. Mary's forced resignation. The regent, who was one of the contending parties, bought the castle from the perfidious governor (Balfour) for 5000*l.* and the priory of Pittenweem. He did not, however, long enjoy the fruits of this in-

famous bargain. Sir William Kirkaldy, the new go-^{Edinburgh.} vernor, a man of great integrity and bravery, declared for the Queen. The city in the mean time was sometimes in the hands of one party and sometimes of another; during which contentions, the inhabitants, as may easily be imagined, suffered extremely. In the year 1570 above mentioned, Queen Elizabeth sent a body of 1000 foot and 300 horse, under the command of Sir William Drury, to assist the king's party. The castle was summoned to surrender; and several skirmishes happened during the space of two years, in which a kind of predatory war was carried on. At last a truce was agreed on till the month of January 1573; and this opportunity the Earl of Morton, now regent, made use of to build two bulwarks across the high-street, nearly opposite to the tolbooth, to defend the city from the fire of the castle.

10
Siege of the
castle in
Queen Eli-
zabeth's
time.

On the first of January, early in the morning, the governor began to cannonade the city. Some of the cannon were pointed against the fish-market, then held on the high street; and the bullets falling among the fishes, scattered them about in a surprising manner, and even drove them up so high in the air, that they fell down upon the tops of the houses. This unusual spectacle having brought a number of people out of their houses, some of them were killed and others dangerously wounded. Some little time afterwards, several houses were set on fire by shot from the castle, and burned to the ground; which greatly enraged the people against the governor.—A treaty was at last concluded between the leaders of the opposite factions; but Kirkaldy refused to be comprehended in it. The regent therefore solicited the assistance of Queen Elizabeth, and Sir William Drury was again sent into Scotland with 1500 foot and a train of artillery. The castle was now besieged in form, and batteries raised against it in different places. The governor defended himself with great bravery for 33 days; but finding most of the fortifications demolished, the well choaked up with rubbish, and all supplies of water cut off, he was obliged to surrender. The English general, in the name of his mistress, promised him honourable treatment; but the Queen of England shamefully gave him up to the regent, by whom he was hanged.

Soon after this, the spirit of fanaticism, which somehow or other succeeded the Reformation, produced violent commotions, not only in Edinburgh, but thro' the whole kingdom. The foundation of these disturbances, and indeed of most others which have ever happened in Christendom on account of religion, was that pernicious maxim of Popery, that the church is independent of the state. It is not to be supposed that this maxim was at all agreeable to the sovereign; but such was the attachment of the people to the doctrines of the clergy, that King James found himself obliged to compound matters with them. This, however, answered the purpose but very indifferently; and at last a violent uproar was excited. The King was then sitting in the Court of Session, which was held in the Tolbooth, when a petition was presented to him by six persons, lamenting the dangers which threatened religion; and being treated with very little respect by one Bruce a minister, his Majesty asked who they were that dared to convene against his proclamation? He was answered

11
The city
incurs the
displeasure
of James VI.

ed.

Edinburgh. ed by Lord Lindsay, that they dared to do more, and would not suffer religion to be overthrown. On this the King perceiving a number of people crowding in to the room, withdrew into another without making any reply, ordering the door to be shut. By this the petitioners were so much enraged, that on their return to the church the most furious resolutions were taken; and had it not been for the activity of Sir Alexander Home the provost, and Mr Watt the deacon-convenor who assembled the crafts in his Majesty's behalf, it is more than probable that the door would have been forced, and an end put to his life. This affront was so much resented by the King, that he thought proper to declare Edinburgh an unfit place of residence for the court or the administration of justice. In consequence of this declaration, he commanded the college of justice, the inferior judges, and the nobility and barons, to retire from Edinburgh, and not to return without express licence. This unexpected declaration threw the whole town into consternation, and brought back the magistrates and principal inhabitants to a sense of their duty. With the clergy it was far otherwise. They railed against the King in the most furious manner; and endeavouring to persuade the people to take up arms, the magistrates were ordered to imprison them: but they escaped by a timely flight. A deputation of the most respectable burghesses was then sent to the King at Linlithgow, with a view to mitigate his resentment. But he refused to be pacified; and on the last day of December 1596 entered the town between two rows of his soldiers who lined the streets, while the citizens were commanded to keep within their houses. A convention of the estates was held in the Tolbooth, before whom the magistrates made the most abject submissions, but all in vain. The convention declared one of the late tumults, in which an attack had been made upon the King's person, to be high treason; and ordained, that if the magistrates did not find out the authors, the city itself should be subjected to all the penalties due to that crime. It was even proposed to raze the town to the foundation, and erect a pillar on the spot where it had stood, as a monument of its crimes. The inhabitants were now reduced to the utmost despair; but Queen Elizabeth interposing in behalf of the city, the King thought proper to abate somewhat of his rigour. A criminal prosecution, however, was commenced, and the town-council were commanded to appear at Perth by the first of February. On their petition, the time for their appearance was prolonged to the first of March; and the attendance of 13 of the common-council was declared sufficient, provided they had a proper commission from the rest. The trial commenced on the fifth day of the month; and one of the number having failed in his attendance, the cause was immediately decided against the council: they were declared rebels, and their revenues forfeited.

12
Is again received into favour.

For 15 days the city continued in the utmost confusion; but at last, on their earnest supplication, and offering to submit entirely to the King's mercy, the community were restored on the following conditions, which they had formerly proffered: That they should continue to make a most diligent search for the authors of the tumult, in order to bring them to condign punishment; that none of the seditious ministers should be

allowed to return to their charges, and no others admitted without his Majesty's consent; and that in the election of their magistrates they should present a list of the candidates to the King and his lords of council and session, whom his Majesty and their lordships might approve or reject at pleasure. To these conditions the King now added some others; viz. that the houses which had been possessed by the ministers should be delivered up to the King; and that the clergymen should afterwards live dispersed through the town, every one in his own parish: That the town-council house should be appointed for accommodating the court of exchequer; and that the town should become bound for the safety of the lords of session from any attempts of the burghesses, under a penalty of 40,000 merks; and, lastly, that the town should immediately pay 20,000 merks to his Majesty.

Upon these terms a reconciliation took place; which appears to have been very complete, as the King not only allowed the degraded ministers to be replaced, but in 1610 conferred a mark of his favour on the town, by allowing the provost to have a sword of state carried before him, and the magistrates to wear gowns on public occasions. In 1618 he paid his last visit to this city, when he was received with the most extravagant pomp and magnificence. See SCOTLAND.

The events which during this period, regard the internal police of the city, were principally the following. After the unfortunate battle at Pinkey, the magistrates, probably apprehending that now their power was enlarged by reason of the common calamity, proceeded in some respects in a very arbitrary manner; forcing the inhabitants to furnish materials for the public works; enjoining merchants to bring home silver to be coined at the mint; and ordering lanterns to be hung out at proper places to burn till nine at night, &c. Another invasion from England being apprehended in 1558, the city raised 1450 men for its defence, among whom there are said to have been 200 tailors, so that their profession seems to have been in a very flourishing state at that time. During the disturbances which happened at the reformation, and of which a particular account is given under the article SCOTLAND, it was enacted, that the figure of St Giles should be cut out of the town standard, and that of a thistle inserted in its place. It was likewise enacted, that none but those who professed the reformed religion should serve in any office whatever; and the better to preserve that extraordinary appearance of sanctity which was affected, a pillar was erected in the North Loch, for the purpose of ducking fornicators.

In 1595, the boys of the High School rose against their masters; and such was the barbarism of those days, that one of these striplings shot a magistrate with a pistol, who had come along with the rest to reduce them to obedience. The reason of the uproar was, that they were in that year refused two vacations, which had been customary in former times: however, they were at last obliged to submit, and ever since have been allowed only one for about six weeks in the autumn. The same year the house of one of the bailies was assaulted by the tradesmen's sons, assisted by journeymen who had not received the freedom of the town: he escaped with his life, but the offenders were banished the city for ever.

In

Edinburgh.
14
Disturbances in the
time of
Charles I.

In the beginning of the reign of Charles I. a perfect harmony seems to have subsisted between the court and the city of Edinburgh; for in 1627 king Charles I. presented the city with a new sword and gown to be worn by the provost at the times appointed by his father James VI. Next year he paid a visit to this capital, and was received by the magistrates in a most pompous manner; but soon after this the disturbances arose which were not terminated but by the death of that unfortunate monarch. These commenced on an attempt of Charles to introduce Episcopacy into the kingdom; and the first step towards this was the erection of the three Lothians and part of Berwick into a diocese, Edinburgh being the episcopal seat, and the church of St Giles the cathedral. An account of the disturbance occasioned by the first attempt to read the prayer-book there, is given under the article BRITAIN; but though the attempt was given over, the minds of the people were not to be quieted. Next winter they resorted to town in such multitudes, that the privy-council thought proper to publish two acts; by one of which the people were commanded, under severe penalties, to leave the town in 24 hours; and by the other, the court of session was removed to Linlithgow. The populace and their leaders were so much enraged by the latter, that lord Traquair and some of the bishops narrowly escaped with their lives; and next year (1638) matters became still more serious. For now, the king having provoked his subjects throughout all Scotland with the innovations he attempted in religion, Edinburgh was made the general place of rendezvous, and the most formidable associations took place; an account of which has already been given under the article BRITAIN. Each of the towns in Scotland had a copy; and that which belonged to Edinburgh, crowded with 5000 names, is still preserved among the records of the city. Notwithstanding this disagreement, however, the king once more visited Edinburgh in 1641, and was entertained by the magistrates at an expence of 12,000l. Scots. It does not appear that after this the city was in any way particularly concerned with the disturbances which followed either throughout the remainder of the reign of Charles I. the commonwealth, or the reign of Charles II. In 1680 the duke of York with his duchess, the princess Anne, and the whole court of Scotland, were entertained by the city in the Parliament House, at the expence of 15,000l. Scots. At this time it is said that the scheme of building the bridge over the North Loch was first projected by the duke.

15
Regulations
made by
the magi-
strates.

From the time that king James VI. paid his last visit to Edinburgh in 1618, till the time of the union in 1707, a considerable number of private regulations were made by the magistrates; some of them evidently calculated for the good of the city, others strongly characteristic of that violent spirit of fanaticism which prevailed so much in the last century. Among the former was an act passed in 1621, that the houses, instead of being covered with straw or boards, should have their roofs constructed of slate, tiles, or lead. This act was renewed in 1667; and in 1698 an act was passed regulating their height also. By this they were restrained to five stories, and the thickness of the wall determined to be three feet at bottom. In 1684 a lantern with a candle was ordered to be hung out in the first floor of

every house in order to light the streets at night; and there were two coaches with four horses each ordered to be bought for the use of the magistrates; but it does not appear how long they continued to be used. In 1681 the court of session discontinued its sittings in summer: but as this was found to be attended with inconvenience, an act was passed for their restoration, which has continued ever since. During the time of the civil war in 1649, the city was visited by the plague, which is the last time that dreadful distemper hath made its appearance in this country. The infection was so violent, that the city was almost depopulated, the prisoners were discharged from the tolbooth, and an act was made for giving one Dr Joannes Politius a salary of 80l. Scots per month, for visiting those who were infected with the disease. In 1677 the first coffee-houses were allowed to be opened, but none without a licence: and the same year the town-council regulated the price of penny weddings; ordaining the men to pay no more than two shillings, and the women 18 pence; very extravagant prices having been exacted before.

In contradistinction to these salutary acts, we may state those which show an extravagant desire of preserving the appearance of virtue in the female sex, as if it had been possible for others to inspire them with virtuous notions if they had not imbibed them of themselves. In 1633 an act of council was passed, by which women were forbidden to wear plaids over their faces, under penalty of five pounds and the forfeiture of the plaid for the first fault. Banishment was the punishment of the third. The reason assigned for this act was, that matrons were not known from strumpets and loose women, while the plaid continued to be worn over the face. This act was renewed in 1637 and 1638. Succeeding town-councils continued to show the same regard to these matters; for in 1695 they enacted, that no inn-keeper, vintner, or ale-seller, should for the future employ women as waiters or servants, under the penalty of five shillings sterling for each.

The following anecdote may perhaps make the virtues of these legislators themselves wear a suspicious aspect. In 1649 the city having borrowed L. 40,000 Scots, in order to raise their quota of men for his majesty, the payment of it was absolutely refused by the town-council when a demand was made for that purpose. That they might not, however, depend entirely upon their own opinion in a matter of such importance, they took that of the General Assembly upon the subject; and it was determined by these reverend divines, that they were not in conscience bound to pay for an unlawful engagement which their predecessors had entered into. But in 1652, Cromwell's parliament, who pretended to no less sanctity than they, declared themselves of a very different opinion; and on the application of one of the creditors, forced them to repay the sum.

The treatment which the brave marquis of Montrose met with, likewise fixes an indelible stigma both upon the magistrates and clergy at that time. Having been put under sentence of excommunication, no person was allowed to speak to him or do him the least office of friendship. Being met without the city by the magistrates and town-guard, he was by them conducted in a kind of gloomy procession through the streets bare-

16
Infamous
treatment
of the mar-
quis of
Montrose.

Edinburgh. bareheaded, and in an elevated cart made for the purpose; the other prisoners walking two and two before him. At the time of his execution he was attended by one of the ministers, who, according to his own account, did not choose to return till *he had seen him casten over the ladder.*

17
Loyalty of
the city in
1715 and
1725.

The union in 1707 had almost produced a war between the two kingdoms which it was designed to unite; and on that occasion Edinburgh became a scene of the most violent disturbances, of which a particular account is given under the article **BRITAIN**. During the time the act was passing, it was found absolutely necessary for the guards and four regiments of foot to do duty in the city. The disturbances were augmented by the disagreement of the two members of parliament; and notwithstanding the victory gained at that time by the court party, Sir Patrick Johnston the provost, who voted for the union, was obliged afterwards to leave the country. In 1715 the city remained faithful to the royal cause, and proper measures were taken for its defence. A committee of safety was appointed, the city-guard increased, and 400 men raised at the expence of the town. The trained bands likewise were ordered out, 100 of whom mounted guard every night: by which precautions the rebels were prevented from attempting the city: they however made themselves masters of the citadel of Leith; but fearing an attack from the duke of Argyle, they abandoned it in the night-time. A scheme was even laid for becoming masters of the castle of Edinburgh; for which purpose they bribed a serjeant to place their scaling ladders. Thus some of the rebels got up to the top of the walls before any alarm was given; but in the mean time the plot being discovered by the serjeant's wife, her husband was hanged over the place where he had attempted to introduce the rebels. The expence of the armament which the city had been at on this occasion amounted to about 1700*l.* which was repaid by government in the year 1721.

18
Captain
Porteous
executed by
a mob.

The loyalty of this city was still farther remarkable in the year 1725, when disturbances were excited in all parts of the kingdom, particularly in the city of Glasgow, concerning the excise-bill; for all remained quiet in Edinburgh, notwithstanding the violent outcries that were made elsewhere: and so remarkable was the tranquillity in the metropolis, that government afterwards returned thanks to the magistrates for it. In 1736, however, the city had again the misfortune to fall under the royal displeasure, on the following account. Two smugglers having been detected in stealing their own goods out of a custom-house, were condemned to be hanged. The crime was looked upon as trivial; and therefore a general murmur prevailed among the populace, which was no doubt heightened by the following accident. At that time it had been customary for persons condemned to die to be carried each Sunday to the church, called from that circumstance the *Tolbooth-church*. The two prisoners just mentioned were conducted in the usual way, guarded by three soldiers, to prevent their making their escape: but having once gone thither a little before the congregation met, one of the prisoners seized one of the guards in each hand, and the other in his teeth, calling out to his companion to run; which he immediately did with such speed, that he soon got out of sight, and

was never heard of afterwards. The person who had **Edinburgh.** thus procured the life of his companion without regard to his own, would no doubt become a general object of compassion; and of course, when led to the place of execution, the guard were severely pelted by the mob, and some of them, according to the testimony of the witnesses who were sworn on the occasion, pretty much wounded. By this Captain Porteous, who commanded the guard, was so much provoked, that he gave orders to fire, by which six people were killed and eleven wounded. The evidence, however, even of the fact that the orders to fire were given, appears not to have been altogether unexceptionable; nevertheless, on this he was tried and condemned to be executed. At that time the king was absent at Hanover, having left the regency in the hands of the queen; and the case of the unfortunate Porteous having been represented to her, she was pleased to grant him a reprieve: but such was the inveteracy of the people against him, that they determined not to allow him to avail himself of the royal clemency. On the day that had been appointed for his execution, therefore, a number of people assembled, shut the gates of the city, and burnt the door of the prison, the same which the mob would formerly have broke open in order to murder king James. They then took out Porteous, whom it was found impossible to rescue out of their hands, though every method that the magistrates could take for that purpose in such a confusion was made use of. It was even proved, that the member of parliament went to the commander in chief, and requested that he would send a party of soldiers to quell the disturbance, but was absolutely denied this request, because he could not produce a written order from the provost to this purport; which, in the confusion then existing in the city, could neither have been expected to be given by the provost, nor would it have been safe for any person to have carried it about him. Thus the unhappy victim was left in the hands of his executioners; and being dragged by them to the place destined for receiving his fate, was hanged on a dyer's sign-post. As they had not brought a rope along with them, they broke open a shop where they knew they were to be had; and having taken out what they wanted, left the money upon the table, and retired without committing any other disorder.

19-

Such an atrocious insult on government could not but be highly resented. A royal proclamation was issued, offering a pardon to any accomplice, and a reward of *l.* 200 to any person who would discover one of those concerned. The proclamation was ordered to be read from every pulpit in Scotland the first Sunday of every month for a twelvemonth: but so divided were the people in their opinions about this matter, that many of the clergy hesitated exceedingly about complying with the royal order, by which they were brought in danger of being turned out of their livings; while those who complied were rendered so unpopular, that their situation was rendered still worse than the others. All the efforts of government, however, were insufficient to produce any discovery; by which, no doubt, the court were still more exasperated: and it was now determined to execute vengeance on the magistrates and city at large. Alexander Wilson, the provost at that time, was imprisoned three weeks before he could

Edinburgh. could be admitted to bail; after which, he and the four bailies, with the lords of justiciary, were ordered to attend the house of peers at London. On their arrival there, a debate ensued, whether the lords should attend in their robes or not? but at last it was agreed, that they should attend in their robes at the bar. This, however, was refused by their lordships, who insisted that they should be examined within the bar; upon which the affair of their examination was dropped altogether. A bill was at last passed both houses, by which it was enacted, that the city of Edinburgh should be fined in 2000 l. for the benefit of Porteous's widow (though she was prevailed upon to accept of L. 1500 for the whole); and the provost was declared incapable of ever serving government again in any capacity whatever. To prevent such catastrophes in time coming, the town-council enacted, that, on the first appearance of an insurrection, the chief officers in the different societies and corporations should repair to the council, to receive the orders of the magistrates for the quelling of the tumult, under the penalty of 8 l. 6 s. 8 d. for each omission.

20
The city
taken by
the rebels
in 1745.

In 1745, the city was invested by the Pretender's army; and on the 17th of September, the Netherbow-gate being opened to let a coach pass, a party of Highlanders, who had reached the gate undiscovered, rushed in, and took possession of the city. The inhabitants were commanded to deliver up their arms at the palace of Holyroodhouse; a certain quantity of military stores was required from the city, under pain of military execution; and an assessment of 2 s. 6 d. upon the pound was imposed upon the *real* rents within the city and liberties, for defraying that expence.

The Pretender's army guarded all the avenues to the castle; but no signs of hostility ensued till the 25th of the month, when the garrison being alarmed from some unknown cause, a number of cannon were discharged at the guard placed at the West-port, but with very little effect. This gave occasion to an order to the guard at the weigh-house, to prevent all intercourse between the city and castle; and then the governor acquainted the provost by letter, that unless the communication was preserved, he would be obliged to dislodge the guard by means of artillery. A deputation was next sent to the Pretender; acquainting him with the danger the city was in, and intreating him to withdraw the guard. With this he refused to comply; and the Highland centinels firing at some people who were carrying provisions into the castle, a pretty smart cannonading ensued, which set on fire several houses, killed some people, and did other damage. The Pretender then consented to dismiss the guard, and the cannonading ceased. After the battle of Culloden, the provost of Edinburgh was obliged to stand a very long and severe trial, first at London and then at Edinburgh, for not defending the city against the rebels; which, from the situation and extent of the walls, every one must have seen to be impossible.

During this trial a very uncommon circumstance happened; the jury having sat two days, insisted that they could sit no longer, and prayed for a short respite. As the urgency of the case was apparent, and both parties agreed, the court, after long reasoning, adjourned till the day following, taking the jury bound under a penalty of L. 500 each; when the court continued sitting

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two days longer, and the jury were one day inclosed. Edinburgh. The event was, that the provost was exculpated.

After the battle of Culloden the duke of Cumberland caused fourteen of the rebel standards to be burned at the cross: that of the pretender was carried by the common executioner, the others by chimney-sweepers; the heralds proclaiming the name of the commanders to whom they belonged as they were thrown into the fire. At this time the city of Edinburgh felt a temporary inconvenience from the election of their magistrates not having taken place at the usual time; so that it became necessary to apply to his majesty for the restoration of the government of the city. This was readily granted, the burgesses being allowed a poll-tax; after which an entire new set of magistrates was returned, all of them friends to the house of Hanover; and soon after the freedom of the city in a gold box was presented to the duke of Cumberland.

With these transactions all interferences betwixt government and the metropolis of Scotland were ended; the rest of its history therefore only consists of internal occurrences, the regulations made by its own magistrates for the benefit of the city, their applications to government for leave to improve it, or the execution of these improvements; of which we shall now give a brief detail.

In the year 1716, the city first bestowed a settled salary on the provost, in order to enable him to support the dignity of first magistrate. This was at first L. 300; but has since been augmented to L. 500, which his lordship still enjoys. In 1718 it was recommended to the magistrates to distinguish themselves by wearing coats of black velvet, for which they were allowed L. 10; but this act being abrogated in 1754, gold chains were assigned as badges of their office, which they still continue to wear. Provost Kincaid happened to die in office in the year 1777; which being a very rare accident, perhaps the only one of the kind to be met with in the records of Edinburgh, he was buried with great solemnity, and a vast concourse of people attended.

Tumults have been frequent in Edinburgh, chiefly on account of the dearth of provisions. In 1740 Bell's mills were first attacked by the populace, and afterwards Leith mills: nor could the rioters be dispersed till the military had fired among them, and wounded three, of whom one died; and it was found necessary to order some dragoons into the city in order to preserve tranquillity. In 1742 another violent tumult took place, owing to a custom of stealing dead bodies from their graves for anatomical purposes, which had then become common. The populace beat to arms, threatened destruction to the surgeons; and in spite of all the efforts of the magistrates demolished the house of the beadle at St Cuthbert's. In 1756, new disturbances, which required the assistance of the military, took place: the cause at this time was the impressing of men for the war which was then commencing. A disturbance was likewise excited in 1760. This was occasioned by the footmen, who till then were allowed to follow their masters into the playhouse, and now took upon them to disturb the entertainment of the company; the consequence of which was, that they were turned out, and have ever since been obliged to wait for their masters. In 1763 and 1765, the tumults on account of the price of provisions were renewed; many of the meal-mongers had

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Edinburgh their houses broken open and their shops destroyed. The magistrates, as usual, were obliged to call in a party of dragoons to quell the disturbance; but at the same time, to put an effectual stop, as far as was in their power, to these proceedings for the future, they gave security, that people who brought grain or provision into the market should be secured in their property. Since that time there have been no tumults directly on the account of provisions; though in 1784 a terrible riot and attack of a distillery at Canonmills took place, on a supposition that the distillers enhanced the price of meal by using unmalted grain. The attack was repelled by the servants of the distillery; but the mob could not be quelled until the sheriff called the soldiers quartered in the castle to his assistance. The same night a party of rioters set out for Ford, a place ten miles to the southward, where there was likewise a large distillery; which, as there was none to make any opposition, they soon destroyed. One man was killed in this riot at Edinburgh by the fire of a servant of the distillery, and several of the rioters were afterwards secured and punished.

In the years 1778 and 1779 two very alarming disturbances happened, which threatened a great deal of bloodshed, though happily they were terminated without any. The first was a mutiny of the earl of Seaforth's Highland regiment, who were at this time quartered in the castle. These having been ordered to embark, for some reason or other unanimously refused, and posted themselves on the top of Arthur's seat, where they continued for two days. Troops were collected to prevent their escape, and the inhabitants were ordered to keep within doors at the first toll of the great bell, which was to be a signal of violence about to take place; but fortunately all the fears, naturally arising from the expectation of this event, were dissipated by an accommodation. The other happened on account of the attempt to repeal the penal laws against the Papists; and was much more alarming than the other, as being the effect of a premeditated scheme and determined resolution to oppose government. On the 2d of February 1779 a mob assembled in the evening, burned a Popish chapel, and plundered another. Next day they renewed their depredations; destroying and carrying off the books, furniture, &c. of several Popish priests and others of that persuasion. The riot continued all that day, though the assistance of the military was called in; but happily no lives were lost, nor was there any firing. The city was afterwards obliged to make good the damage sustained by the Catholics on this occasion, which was estimated at L. 1500. This year also an unlucky accident happened at Leith. About 50 Highland recruits having refused to embark, a party of the South Fencibles was sent to take them prisoners. Unexpectedly, however, the Highlanders stood upon their defence; when, after some words, a firing commenced on both sides, and about one half of the Highlanders were killed and wounded, the remainder being taken prisoners and carried to the castle. Captain Mansfield and two or three privates were killed in this affray.

24
General
history of
the im-
prove-
ments.

We shall close this history of Edinburgh with a general account of the improvements which have lately taken place in it, and of which a particular description

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will afterwards be given. These began in the year Edinburgh. 1753, when the foundation-stone of the Exchange was laid, at which time there was a grand procession, and the greatest concourse of people ever known in Edinburgh. A triumphal arch was erected for the purpose, through which the procession passed, and medals were scattered among the populace. In 1756 the high street was cleared by the removal of the cross; though many regretted this, on account of its being a very ancient and elegant building. In the middle it had an unicorn placed on the top of a pillar 20 feet high; but this fine ornament was broken to pieces by the giving way of the tackle by which it was attempted to remove it. It is now again erected at Drum, a seat belonging to lord Somerville, about four miles from Edinburgh. In 1763 the first stone of the north bridge was laid by provost Drummond; and in 1767 an act of parliament was obtained for extending the royalty of the city over the fields to the northward, where the New Town is now situated. About the same time a spot of ground upon the south side of the town was purchased by a private person for L. 1200, which being feued out for building, gave rise to the increase of the town on that quarter; and this proceeded the more rapidly, as the houses built there were free from the dues imposed upon others subject to the royalty. In 1774 the foundation of the Register-Office was laid. In 1784 the project for rendering the access to the town equally easy on both sides was begun to be put in execution by laying the foundation of the south bridge. At the same time a great improvement was made by reducing the height of the street several feet all the way from the place where the cross stood to the Netherbow; by which means the ascent is rendered more easy, not only for carriages, but also for persons who walk on foot. At the same time, the street was farther cleared by the removal of the town guard-house, which had long been complained of as an encumbrance. It is still farther in contemplation to remove the Luckenbooths: and when this is accomplished, with other improvements by which it must necessarily be accompanied, it is to be questioned whether any city in Britain will be able to vie with Edinburgh in elegance and beauty.

Having thus given a concise history of the city from its earliest foundation, we shall now proceed to describe it in its most improved state.

Edinburgh is situated upon a steep hill, rising from east to west, and terminating in a high and inaccessible rock, upon which the castle stands. At the east end or lower extremity of this hill stands the abbey of Holyrood-house, or king's palace, distant from the castle upwards of a mile; and betwixt which, along the top of the ridge, and almost in a straight line, runs the high-street. On each side, and parallel to this ridge or hill, is another ridge of ground lower than that in the middle, and which does not extend so far to the east; that on the south being intercepted by Salisbury-rocks and Arthur's-seat, a hill of about 800 feet of perpendicular height; and that on the north by the Calton-hill, considerably lower than Arthur's-seat: so that the situation of this city is most singular and romantic; the east or lower part of the town lying between two hills; and the west or higher part rising up

25
Description
of Edin-
burgh.

Qq

towards

Edinburgh towards a third hill, little inferior in height to the highest of the other two, upon which, as has been observed, the castle is built, and overlooks the town.

The buildings of the town terminate at the distance of about 200 yards from the castle-gate; which space affords a most delightful as well as convenient and healthful walk to the inhabitants. The prospect from this spot is perhaps the finest any where to be met with, for extent, beauty, and variety.

In the valley or hollow betwixt the mid and the south ridges, and nearly parallel to the high-street, is another street called the Cowgate; and the town has now extended itself over most part of that south ridge also. Betwixt the mid and the north ridges was a loch, which, till of very late, terminated the town on that side. From the high-street towards the loch on the north, and Cowgate on the south, run narrow cross streets or lanes, called *wynd*s and *clofes*, which grow steeper and steeper the farther west or nearer the castle; so that, were it not for the closeness and great height of the buildings, this city, from its situation and plan, might naturally be expected to be the best aired, as well as the cleanest, in Europe. The former, notwithstanding these disadvantages, it enjoys in an eminent degree; but we cannot compliment it upon the latter, notwithstanding every possible means has been used by the magistrates for that purpose.

The steepness of the ascent makes the access to the high-street from the north and south very difficult; which no doubt greatly retarded the enlargement of the city. To remedy this inconvenience on the north, and with a view to extend the town on that quarter, a most elegant bridge has been thrown over the north loch, which joins the north ridge to the middle of the high-street, by so easy an ascent as one in sixteen; and in pursuance of the design, a plan of a new town to the north was fixed upon, and is now nearly finished, with an elegance and taste that does honour to this country. In like manner, to facilitate the access from the south side, a bridge has been thrown over the valley through which the Cowgate runs; which, if not equally elegant with the north bridge, is certainly as convenient.

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Account of
the gradual
increase of
Edinburgh.

The gradual increase of the city of Edinburgh may in some degree be understood from the traces of its ancient walls that still remain. James II. in 1450, first bestowed on the community the privilege of fortifying the city with a wall, and empowered them to levy a tax upon the inhabitants for defraying the expence. When the city was first fortified, the wall reached no further than the present water-house, or reservoir, on the castle-hill: from thence to the foot of Halkerston's wynd, just below the new-bridge, the city was defended by the north-loch; an inconsiderable morass, which, being formerly overflowed, formed a small lake that hath since been drained. From this place to the foot of Leith-wynd, it does not appear how the city was fortified: but from the foot of Leith-wynd to the Nether-bow-port it was defended only by a range of houses; and when these had become ruinous, a wall was built in their place. The original wall of Edinburgh, therefore, began at the foot of the north-east rock of the castle. Here it was strengthened by a small fortress, the ruins of which are still to be seen, and are called the *well-house tower*, from their having a spring in their

neighbourhood. When the wall came opposite to the reservoir, it was carried quite across the hill, having a gate on the top for making a communication between the town and castle. In going down the hill, it went slanting in an oblique direction to the first angle in going down the West-bow, where was a gate named the *Upper-bow port*, one of the hooks of which still remains. Thence it proceeded eastward in such a manner, as would have cut off not only all the Cowgate, but some part of the parliament-house; and being continued as far as the mint-close, it turned to the north-east, and connected itself with the buildings on the north side of the high-street, where was the original *Nether-bow Port*, about 50 yards west from that which afterwards went by the same name.

Soon after the building of this wall, a new street was formed on the outside of it, named the *Cowgate*, which in the 16th century became the residence of the nobility, the senators of the college of justice, and other persons of the first distinction. After the fatal battle of Flowden, however, the inhabitants of the Cowgate became very anxious to have themselves defended by a wall as well as the rest. The wall of the city was therefore extended to its present limits. This new wall begins on the south-east side of the rock on which the castle is built, and to which the town-wall comes quite close. From thence it descends obliquely to the West-port; then ascends part of a hill on the other side, called the *High Riggs*; after which, it runs eastward with but little alteration in its course, to the Bristo and Potter-row ports, and from thence to the Pleasance. Here it takes a northerly direction, which it keeps from thence to the Cowgate-port; after which the inclosure is completed to the Netherbow by the houses of St Mary's wynd. The original Netherbow port being found not well adapted for defence was pulled down, and a new one built in 1571 by the adherents of queen Mary. In 1606, the late handsome building was erected about 50 yards below the place where the former stood. It was two stories high, and had an elegant spire in the middle; but being thought to encumber the street, and the whole building being in a crazy situation, it was pulled down by order of the magistrates in 1764.

In the original wall of Edinburgh there was, as has been already observed, a port on the castle-hill. On the extension of the wall, after building the houses in the Cowgate, this gate was pulled down. That in the upper or west bow stood for a much longer time, and was pulled down within the memory of some persons lately or perhaps still living. Besides these, there was a third, about 50 yards above the head of the Canon-gate; but whether there were any more, is uncertain. The ports or gates of the new walls were, 1. The *West-port*, situated at the extremity of the Grass-market; beyond which lies a suburb of the town and a borough of regality, called *Portsburgh*. Next to this is a wicket, struck out of the town-wall in 1744, for the purpose of making an easier communication between the town and the public walks in the meadows, than by Bristo-port. The next to this was *Bristo-port*, built in 1515; beyond which lies a suburb called *Bristo-street*. At a small distance from Bristo was the *Potter-row Port*, which took this name from a manufactory of earthen ware in the neighbourhood. Formerly it was called *Kirk of Field*.

Edinburgh. *Field Port*. Between this and the Cowgate-port stood another, called *St Mary's Wynd Port*, which extended from east to west across the foot of the Pleasance, and which was demolished only since the middle of the last century.—Close to the middle of this stood the *Cowgate-port*; which opened a communication between the Cowgate and St Mary's wynd, and the Pleasance.—The *Nether-bow Port* has been already spoken of.—At the foot of Leith-wynd was another gate, known by the name of *Leith-wynd Port*; and within it was a wicket giving access to the church of Trinity College, and which still remains. At the foot of Halkerston's wynd was another, which, as well as the former, was built about the year 1560. Both of these were pulled down some years ago, and all the rest in 1785.—Another still remains at the foot of the Canongate, known by the name of the *Water-gate*.

For 250 years the city of Edinburgh occupied the same space of ground, and it is but very lately that its limits have been so considerably enlarged. In the middle of the 16th century, it is described as extending in length about an Italian mile, and about half as much in breadth; which answers very nearly to its present limits, the late enlargements only excepted.—This space of ground, however, was not at that time occupied in the manner it is at present. The houses were neither so high nor so crowded upon each other as they are now. This was a consequence of the number of inhabitants increasing, which has occasioned the raising of the houses to such an height as is perhaps not to be paralleled in any other part of the world. Till the time of the Reformation, the burying ground of the city extended over all the space occupied by the Parliament-square, and from thence to the Cowgate. The lands lying to the southward of the Cowgate were chiefly laid out in gardens belonging to the convent of Black-friars, and the church of St Mary in the Field. These extended almost from the Pleasance to the Potterrow-port. From the Bristo to the West-Port, the ground was laid out in gardens belonging to the Gray-friars. The magistrates, on their application to queen Mary, obtained a grant of the Gray-friars gardens for a burying-place; for which it was given as a reason, that they were somewhat distant from the town. Here, however, it must be understood, that these gardens were distant from the houses, and not without the walls; for they had been inclosed by them long before.—In the time of James I. the houses within the walls seem to have been in general, if not universally, covered with thatch or broom; and not above 20 feet high. Even in the year 1621, these roofs were so common, that they were prohibited by act of parliament, in order to prevent accident from fire.—In the middle of the last century, there were neither courts nor squares in Edinburgh. The Parliament close or square is the oldest of this kind in the city. Miln's square, James's court, &c. were built long after; and Argyle's and Brown's squares within these 50 years.

27
New
Town.

The *New Town* was projected in the year 1752; but as the magistrates could not then procure an extension of the royalty, the execution of the design was suspended for some time. In 1767, an act was obtained, by which the royalty was extended over the

fields to the northward of the city; upon which advertisements were published by the magistrates, desiring proper plans to be given in. Plans were given in accordingly, and that designed by Mr James Craig architect was adopted. Immediately afterwards, people were invited to purchase lots from the town-council; and such as purchased became bound to conform to the rules of the plan. In the mean time, however, the town-council had secretly reserved to themselves a privilege of departing from their own plan; which they afterwards made use of in such a manner as produced a law-suit. According to the plan held forth to the purchasers, a canal was to be made through that place where the north-loch had been, and the bank on the north side of it laid out in terraces: but instead of this, by an act of council, liberty was reserved to the town to build upon this spot; and therefore, when many gentlemen had built genteel houses in the new town on faith of the plan, they were surprised to find the spot appointed for terraces and a canal, beginning to be covered with mean irregular buildings, and work-houses for tradesmen. This deviation was immediately complained of; but as the magistrates showed no inclination to grant any redress, a prosecution was commenced against them before the Lords of Session. In that court the cause was given against the pursuers, who thereupon appealed to the House of Lords. Here the sentence of the Court of Session was reversed, and the cause remitted to the consideration of their Lordships. At last, after an expensive contest, matters were accommodated. The principal term of accommodation was, that some part of the ground was to be laid out in terraces and a canal; but the time of disposing it in that manner, was referred to the Lord President of the Court of Session and the Lord Chief Baron of the Exchequer.—The fall of part of the bridge, hereafter mentioned, proved a very considerable disadvantage to the new town; as it necessarily induced a suspicion that the passage, by means of the bridge, could never be rendered safe. An oversight of the magistrates proved of more essential detriment. A piece of ground lay to the southward of the old town, in a situation very proper for building. This the magistrates had an opportunity of purchasing for 1200l; which, however, they neglected, and it was bought by a private person, who immediately feued it out in lots for building, as has been already mentioned. The magistrates then began to see the consequence, namely, that this spot being free from the duties to which the royalty of Edinburgh is subject, people would choose to reside there rather than in the New Town. Upon this they offered the purchaser 2000l. for the ground for which he had paid 1200l.; but as he demanded 20,000l. the bargain did not take place. Notwithstanding these discouragements, the New Town is now almost finished; and from the advantages of its situation, and its being built according to a regular plan, it hath undoubtedly a superiority over any city in Britain. By its situation, however, it is remarkably exposed to storms of wind, which, at Edinburgh, sometimes rage with uncommon violence.

It has three streets, almost a mile in length, running from east to west, intersected with cross streets at proper distances.

Edinburgh. distances. The most northerly, called *Queen's Street*, is 100 feet broad, and commands an extensive prospect of the Forth, the county of Fife, and the shipping in the river. That called *George's Street*, which is in the middle, is no less than 15 feet wide. It is terminated at each end by two very elegant and extensive squares; that on the east end is called *St Andrew's Square*; the other, tho' not yet finished, nor indeed begun, is to be named *Charlotte's Square*. Prince's street is the most southerly; and extends from the northern extremity of the bridge, quite to the west end of the town; though as that is not yet finished, we cannot say whether it will be done exactly according to the plan laid down, as there has been a proposal made by a private person of continuing the whole a considerable way farther to the westward, to end in a circus. The reason given for this proposed innovation is, that the road to Glasgow and other parts in the west will thus be rendered more easy, as it will then lie along the new bridge over the Water of Leith at Bell's mills, which is much more convenient than that just now in use.

The most remarkable public buildings in Edinburgh are:

28
Public
buildings
described.

1. *The Castle*. This stands on a high rock, accessible only on the east side. On all others it is very steep, and in some places perpendicular. It is about 300 feet high from its base: so that, before the invention of artillery, it might well have been deemed impregnable; though the event showed that it was not.—The entry to this fortress is defended by an outer barrier of palisadoes; within this is a dry ditch, draw-bridge, and gate, defended by two batteries which flank it; and the whole is commanded by an half-moon mounted with brass cannon, carrying balls of 12 pounds. Beyond these are two gate-ways, the first of which is very strong, and has two portcullises. Immediately beyond the second gate-way, on the right hand, is a battery mounted with brass cannon, carrying balls of 12 and 18 pounds weight. On the north side are a mortar and some gun batteries.—The upper part of the castle contains a half-moon battery, a chapel, a parade for exercise, and a number of houses in the form of a square, which are laid out in barracks for the officers. Besides these there are other barracks sufficient to contain 1000 men; a powder magazine bomb-proof; a grand arsenal, capable of containing 8000 stand of arms; and other apartments for the same use, which can contain 22,000 more: so that 30,000 stand of arms may be conveniently lodged in this castle.—On the east side of the square above mentioned, were formerly royal apartments; in one of which king James VI. was born, and which is still shown to those who visit the castle. In another, the regalia of Scotland were deposited on the 26th of March 1707, and are said to be still kept there; but they are never shown to any body. Hence a suspicion has arisen that they have been carried to London; which is the more confirmed, as the keeper of the jewel-office in the tower of London shows a crown, which he calls that of Scotland; and it is certain that the door of what is called the *Crown-room* has not been publicly known to be opened since the union.

The governor of the castle is generally a nobleman, whose place is worth about 1000l. a-year; and that of deputy-governor, 500l. This last resides in the house ap-

pointed for the governor, as the latter never inhabits it. Edinburgh. There is also a fort-major, a store-keeper, master gunner, and chaplain; but as this last does not reside in the castle, worship is seldom performed in the chapel. The parliament-house was formerly included in the great square on the top, and the royal gardens were in the marsh afterwards called the *North-loch*; the king's stables being on the south side, where the houses still retain the name, and the place where the barns were still retain the name of *Castle-barns*.

The castle is defended by a company of invalids, and four or five hundred men belonging to some marching regiment, though it can accommodate 1000, as above-mentioned; and this number has been sometimes kept in it. Its natural strength of situation was not sufficient to render it impregnable, even before the invention of artillery, as we have already observed; much less would it be capable of securing it against the attacks of a modern army well provided with cannon. It could not, in all probability, withstand, even for a few hours, a well directed bombardment: for no part but the powder-magazine is capable of resisting these destructive machines; and the splinters from the rock on which the castle is built, could not fail to render them still more formidable. Besides, the water of the well, which is very bad, and drawn up from a depth of 100 feet, is apt to subside on the continued discharge of artillery, which produces a concussion in the rock.

2. *The Palace of Holyrood-house*. This, though much neglected, is the only royal habitation in Scotland that is not entirely in ruins. It is a handsome square of 230 feet in the inside, surrounded with piazzas. The front, facing the west, consists of two double towers joined by a beautiful low building, adorned with a double balustrade above. The gateway in the middle is decorated with double stone columns, supporting a cupola in the middle, representing an imperial crown, with a clock underneath. On the right hand is the great staircase which leads to the council chamber and the royal apartments. These are large and spacious, but unfurnished: in one of them the Scotch peers meet to elect 16 of their number to represent them in parliament. The gallery is on the left hand, and measures 150 feet by 27½. It is adorned with the supposed portraits of all the kings of Scotland. In the apartments of the duke of Hamilton, which he possesses as hereditary keeper of the palace, queen Mary's bed of crimson damask, bordered with green fringes and tassels, is still to be seen, but almost reduced to rags. Here also strangers are shown a piece of wainscot hung upon hinges, which opens to a trap-stair communicating with the apartments below. Through this passage Darnley and the other conspirators rushed in to murder the unhappy Rizzio. Towards the outward door of these apartments are large dusky spots on the floor, said to be occasioned by Rizzio's blood, which could never be washed out. In the lodgings assigned to lord Dunmore is a picture by Van Dyke, esteemed a masterly performance, of king Charles I. and his queen going a-hunting. There are likewise the portraits of their present majesties at full length by Ramsay. The lodgings above the royal apartments are occupied by the duke of Argyle as heritable master of the household.

The front of this palace is two stories high; the roof

Edinburgh roof flat; but at each end the front projects, and is ornamented with circular towers at the angles. Here the building is much higher, and the rest of the palace is three stories in height. The north-west towers were built by James V. for his own residence: his name is still to be seen below a niche in one of these towers. During the minority of queen Mary, this palace was burned by the English; but soon after repaired and enlarged beyond its present size. At that time it consisted of five courts, the most westerly of which was the largest. It was bounded on the east by the front of the palace, which occupied the same space it does at present; but the building itself extended further to the south. At the north-west corner was a strong gate, with Gothic pillars, arches, and towers, part of which was not long ago pulled down. Great part of the palace was burnt by Cromwell's soldiers; but it was repaired and altered into the present form after the Restoration. The fabric was planned by Sir William Bruce a celebrated architect, and executed by Robert Mylne mason. The environs of the palace afford an asylum for insolvent debtors; and adjoining to it is an extensive park, all of which is a sanctuary.

The abbey church was formerly called the *monastery of Holyrood-house*, and built by king David I. in 1128. He gave it the name of *Holyrood-house*, in memory, as is said, of his deliverance from an enraged hart, by the miraculous interposition of a cross from heaven. This monastery he gave to the canons regular of St Augustine: on whom he also bestowed the church of Edinburgh castle, with those of St Cuthbert's, Corstorphin, and Libberton, in the shire of Mid-Lothian, and of Airth in Stirlingshire; the priories of St Mary's isle in Galloway, of Blantyre in Clydesdale, of Rowadill in Ross, and three others in the Western Isles. To them he also granted the privilege of erecting a borough between the town of Edinburgh and the church of Holyrood-house. From these canons it had the name of the *Canongate*, which it still retains. In this new borough they had a right to hold markets. They had also portions of land in different parts, with a most extensive jurisdiction, and right of trial by duel, and fire and water ordeal. They had also certain revenues payable out of the exchequer and other funds, with fishings, and the privilege of erecting mills on the water of Leith, which still retain the name of *Canon-mills*. Other grants and privileges were bestowed by succeeding sovereigns; so that it was deemed the richest religious foundation in Scotland. At the Reformation, its annual revenues were, 442 bolls of wheat, 640 bolls of bear, 560 bolls of oats, 500 capons, two dozen of hens, as many salmon, 12 loads of salt; besides a great number of swine, and about 250 l. sterling in money. At the Reformation, the superiority of North Leith, part of the Pleasance, the barony of Broughton, and the Canongate, was vested in the earl of Roxburgh; and were purchased from him by the town-council of Edinburgh in 1636. In 1544, the church suffered considerably by the invasion of the English; but was speedily repaired. At the Restoration, king Charles II. ordered the church to be set apart as a chapel-royal, and prohibited its use as a common parish church for the future. It was then fitted up in a very elegant manner. A throne was

erected for the sovereign, and 12 stalls for the knights **Edinburgh** of the order of the thistle: but as masons had been celebrated in it in the reign of James VII. and it had an organ, with a spire, and a fine chime of bells on the west side, the Presbyterians at the revolution entirely destroyed its ornaments, and left nothing but the bare walls.—Through time, the roof of the church became ruinous; on which the duke of Hamilton represented its condition to the barons of exchequer, and craved that it might be repaired. This request was complied with: but the architect and mason who were employed, covered the roof with thick flag-stones, which soon impaired the fabric; and on the 2d of December 1768, the roof fell in. Since that time, no attempt has been made to repair it, and it is now entirely fallen to ruin.

The ruins of this church, however, are still sufficient to discover the excellency of the workmanship. Here some of the king's of Scotland are interred; and an odd kind of curiosity has been the occasion of exposing some bones said to be those of lord Darnley and a countess of Roxburgh who died several hundred years ago. Those said to belong to the former were very large, and the latter had some flesh dried upon them. The chapel was fitted up in the elegant manner above mentioned by James VII. but such was the enthusiasm of the mob, that they not only destroyed the ornaments, but tore up even the pavement, which was of marble.

To the eastward of the palace is the bowling-green, now entirely in disorder; and behind it is a field called *St Ann's Yards*. Beyond this is a piece of ground called *the King's Park*; which undoubtedly was formerly overgrown with wood, though now there is not a single tree in it. It is about three miles in circumference; and was first inclosed by James V. It contains the rocky hills of *ARTHUR'S SEAT* and Salisbury Craigs, which last afford an inexhaustible stone quarry; and upon the north side of the hill stands an old ruinous chapel, dedicated to St Anthony. The stones are used in building, as well as for paving the streets and high-ways. The park was mortgaged to the family of Haddington for a debt due to them; and by the present earl has been divided into a number of inclosures by stone-dykes raised at a considerable expence. A good number of sheep and some black cattle are fed upon it; and it is now rented at 1500 l. annually.

3. *St Giles's Church* is a beautiful Gothic building, measuring in length 206 feet. At the west end, its breadth is 110; in the middle, 129; and at the east end, 76 feet. It has a very elevated situation, and is adorned with a lofty square tower; from the sides and corners of which rise arches of figured stonework: these meeting with each other in the middle, complete the figure of an imperial crown, the top of which terminates in a pointed spire. The whole height of this tower is 161 feet.

This is the most ancient church in Edinburgh. From a passage in an old author called *Simeon Dunelmensis*, some conjecture it to have been built before the year 854; but we do not find express mention made of it before 1359. The tutelar saint of this church, and of Edinburgh, was St Giles, a native of Greece. He lived in the sixth century, and was descended of an illustrious family. On the death of his parents, he gave

Edinburgh gave all his estate to the poor; and travelled into France, where he retired into a wilderness near the conflux of the Rhone with the sea, and continued there three years. Having obtained the reputation of extraordinary sanctity, various miracles were attributed to him; and he founded a monastery in Languedoc, known long after by the name of *St Giles's*.—In the reign of James II. Mr Preston of Gorton, a gentleman whose descendents still possess an estate in the county of Edinburgh, got possession of the arm of this saint; which relic he bequeathed to the church of Edinburgh. In gratitude for this donation, the magistrates granted a charter in favour of Mr Preston's heirs, by which the nearest heir of the name of Preston was entitled to carry it in all processions. At the same time, the magistrates obliged themselves to found an altar in the church of *St Giles's*, and appoint a chaplain for celebrating an annual mass for the soul of Mr Preston; and likewise, that a tablet, containing his arms, and an account of his pious donation, should be put up in the chapel.—*St Giles's* was first simply a parish-church, of which the bishop of Lindisfarn or Holy Island, in the county of Northumberland, was patron. He was succeeded in the patronage by the abbot and canons of Dunfermline, and they by the magistrates of Edinburgh. In 1466, it was erected into a collegiate church by James III.—At the Reformation, the church was, for the greater convenience, divided into several parts. The four principal ones are appropriated to divine worship, the lesser ones to other purposes. At the same time the religious utensils belonging to this church were seized by the magistrates. They were,—*St Giles's* arm, enshrined in silver, weighing five pounds three ounces and an half; a silver chalice, or communion-cup, weighing 23 ounces; the great *eucharist* or communion-cup, with *golden ewike and stones*; two cruets of 25 ounces; a golden bell, with a heart, of four ounces and a half; a golden unicorn; a golden pix, to keep the host; a small golden heart, with two pearls; a diamond ring; a silver chalice, patine, and spoon, of 32 ounces and a half: a communion-table-cloth of gold brocade; *St Giles's coat*, with a little piece of red velvet which hung at his feet; a round silver *eucharist*: two silver censers, of three pounds fifteen ounces; a silver ship for incense; a large silver cross, with its base, weighing sixteen pounds thirteen ounces and a half; a triangular silver lamp; two silver candlesticks, of seven pounds three ounces; other two, of eight pounds thirteen ounces; a silver chalice gilt, of 20½ ounces; a silver chalice and cross, of 75 ounces; besides the priests robes, and other vestments, of gold brocade, crimson velvet embroidered with gold, and green damask.—These were all sold, and part of the money applied to the repairs of the church; the rest was added to the funds of the corporation.

In the steeple of *St Giles's* church are three large bells brought from Holland in 1621; the biggest weighing 2000 lb. the second 700, and the third 500. There are also a set of music bells, which play every day between one and two o'clock, or at any time in the case of rejoicings. The principal division is called the *High Church*, and has been lately repaired and new seated. There is a very elegant and finely ornamented seat for his majesty, with a canopy supported by four Corinthian pillars decorated in high taste.

This seat is used by the king's commissioner during the time the General Assembly sits. On the right hand is a seat for the lord high constable of Scotland, whose office it is to keep the peace within doors in his majesty's presence; it being the duty of the earl marshal to do the same without. The seats belonging to the lords of council and session are on the right of the lord high constable; and on the left of the throne was a seat for the lord high chancellor of Scotland; but that office being now abolished, the seat is occupied by others. On the left of this sit the barons of exchequer; and, to the left of them, the lord provost, magistrates, and town-council. The pulpit, king's seat, and galleries, are covered with crimson velvet with gold and silk fringes.

The aisle of *St Giles's* church is fitted up with seats for the general assembly who meet here; and there is a throne for his majesty's commissioner with a canopy of crimson silk damask, having the king's arms embroidered with gold, presented by the late lord Cathcart to his successor in office. In this church is a monument dedicated to the memory of lord Napier, baron of Merchiston, well known as the inventor of logarithms; a second to the earl of Murray, regent of Scotland during the minority of James VI.; and a third to the great marquis of Montrose.

4. *The Parliament House*, in the great hall of which the Scottish parliament used to assemble, is a magnificent building. The hall is 123 feet long and 42 broad, with a fine arched roof of oak, painted and gilded. In this the lawyers and agents now attend the courts, and single judges sit to determine causes in the first instance, or to prepare them for the whole court, who sit in an inner room formerly appropriated to the privy-council. In a nich of the wall is placed a fine marble statue of president Forbes, erected at the expence of the faculty of advocates. There are also full length portraits of king William III. queen Mary his consort, and queen Anne, all done by Sir Godfrey Kneller; also of George I. John duke of Argyle, and Archibald duke of Argyle, by Mr Aikman of Cairney.

Above stairs are the court of exchequer and treasury chamber, with the different offices belonging to that department; and below is one of the most valuable libraries in Great Britain, belonging to the faculty of advocates. Besides 30,000 printed volumes, there are many scarce and valuable manuscripts, medals, and coins: here is also an entire mummy in its original chest, presented to the faculty (at the expence of 300 l.) by the earl of Morton, late president of the royal society. As these rooms are immediately below the hall where the parliament sat, they are subject to a search by the lord high constable of Scotland ever since the gun-powder plot; and this is specified in the gift from the city to the faculty. This library was founded, in the year 1682, by Sir George Mackenzie lord advocate. Among other privileges, it is intitled to a copy of every book entered in stationer's hall. Before the great door is a noble equestrian statue of Ch. II. the proportions of which are reckoned exceedingly just. Over the entrance are the arms of Scotland, with Mercy and Truth on each side for supporters.

The court of session, the supreme tribunal in Scotland, consists of 15 judges, who sit on a circular bench, clothed in purple robes turned up with crimson velvet. Six of these are lords of the justiciary, and go the circuit

Edinburgh. cuit twice a-year; but, in that capacity, they wear scarlet robes turned up with white fatten.

5. *The Tolbooth* was erected in 1561, not for the purposes merely of a prison, but likewise for the accommodation of the parliament and other courts; but it has since become so very unfit for any of these purposes, that it is now proposed to pull it down and rebuild it in some other place, especially as it is very inconvenient in its present situation on account of its incumbering the street. The provost is captain of the tolbooth, with a gaoler under him: and the latter has a monopoly of all the provisions for the prisoners; a circumstance which must certainly be considered as a grievous oppression, those who are least able to purchase them being thus obliged to do so at the highest price. There is a chaplain who has a salary of 30l. a-year.

6. There is a Hall in the Writers Court belonging to the clerks to his majesty's signet, where there is also an office for the business of the signet. The office of keeper of the signet is very lucrative, and he is allowed a depute and clerks under him. Before any one enters into this society he must attend the college for two years, and serve five years as an apprentice to one of the society. There is a good library belonging to this hall, which is rapidly increasing, as every one who enters must pay 10l. towards it. He pays also 100l. of apprentice-fee, and 100l. when he enters.

7. *The Exchange* is a large and elegant building, with a court of about 90 feet square in the middle. On the north side are piazzas where people can walk under cover, the other three sides being laid out in shops; but the merchants have never made use of it to meet in, still standing in the street as formerly. The back part of the building is used for the general custom-house of Scotland, where the commissioners meet to transact business. They have above 20 offices for the different departments, to which the access is by a hanging stair 60 feet in height. In looking over the window before he ascends this stair, a stranger is surprised to find himself already 40 feet from the ground, which is owing to the declivity on which the exchange is built. For the customhouse rooms the city receives a rent of 1l. per day.

The Trustees Office for the improvement of fisheries and manufactures in Scotland is in the south-west corner of the exchange; the fund under their management being part of the equivalent money given to Scotland at the Union. This is distributed in premiums amongst those who appear to have made any considerable improvement in the arts.

7. *The North Bridge*, which forms the main passage of communication betwixt the Old and New Towns, was founded, as has already been observed, in 1763 by Provost Drummond; but the contract for building it was not signed till August 21st 1765. The architect was Mr William Mylne, who agreed with the town-council of Edinburgh to finish the work for 10,140l. and to uphold it for 10 years. It was also to be finished before Martinmas 1769: but on the 3d of August that year, when the work was nearly completed, the vaults and side-walls on the south fell down, and five people were buried in the ruins. This misfortune was occasioned by the foundation having been laid, not upon the solid earth, but upon the rubbish of the houses

which had long before been built on the north side of Edinburgh. the high-street, and which had been thrown out into the hollow to the northward. Of this rubbish there were no less than eight feet between the foundation of the bridge and the solid earth. Besides this deficiency in the foundation, an immense load of earth which had been laid over the vaults and arches in order to raise the bridge to a proper level, had no doubt contributed to produce the catastrophe above mentioned.—The bridge was repaired, by pulling down some parts of the side-walls, and afterwards rebuilding them; strengthening them in others with chain-bars; removing the quantity of earth laid upon the vaults, and supplying its place with hollow arches, &c. The whole was supported at the south end by very strong buttresses and counterforts on each side; but on the north it has only a single support.—The whole length of the bridge, from the High-street in the Old Town to Prince's-street in the New, is 1125 feet; the total length of the piers and arches is 310 feet. The width of the three great arches is 72 feet each; of the piers, 13½ feet; and of the small arches, each 20 feet. The height of the great arches, from the top of the parapet to the base, is 68 feet; the breadth of the bridge within the wall over the arches is 40 feet, and the breadth at each end 50 feet.—On the southern extremity of this bridge stands the General Post Office for Scotland; a neat plain building, with a proper number of apartments for the business, and a house for the secretary.

The communication betwixt the two towns by means of this bridge, though very complete and convenient for such as lived in certain parts of either, was yet found insufficient for those who inhabited the western districts. Another bridge being therefore necessary, it was proposed to fill up the valley occasionally with the rubbish dug out in making the foundations of houses in the New Town; and so great was the quantity, that this was accomplished so as to be fit for the passage of carriages in little more than four years and an half.

8. *The South Bridge* is directly opposite to the other, so as to make but one street, crossing that called the High-street almost at right angles. It consists of 19 arches of different sizes: but only one of them is visible, viz. the large one over the Cowgate; and even this is small in comparison with those of the North Bridge, being no more than 30 feet wide and 31 feet high. On the south it terminates at the University on one hand, and the Royal Infirmary on the other. The Tron Church, properly called *Christ Church*, stands at the northern extremity, facing the High-street, and in the middle of what is now called *Hunter's Square*, in memory of the late worthy chief magistrate who planned these improvements, but did not live to see them executed. On the west side of this square the Merchant Company have built a very handsome hall for the occasional meetings of their members. This bridge was erected with a design to give an easy access to the great number of streets and squares on the south side, as well as to the country on that quarter from whence the city is supplied with coals. The street on the top is supposed to be as regular as any in Europe; every house being of the same dimensions, excepting that between every two of the ordinary construction there is one with a pediment on the top, in order to prevent that

Edinburgh. that sameness of appearance which would otherwise take place. So great was the rage for purchasing ground on each side of this bridge for building, that the areas sold by public auction at 50l. per foot in front. By this the community will undoubtedly be considerable gainers; and the proprietors hope to indemnify themselves for their extraordinary expence by the vast sale of goods supposed to attend the shops in that part of the town; though this seems somewhat more dubious than the former.

9. *The Concert Hall*, called also *St Cecilia's Hall*, stands in Niddery's-street; and was built in 1762, after the model of the great opera-theatre in Parma. The plan was drawn by Sir Robert Mylne, architect of Blackfriars bridge. The musical room is of an oval form, the ceiling being a concave elliptical dome, lighted from the top by a lanthorn. The seats are ranged in the form of an amphitheatre; and are capable of containing 500 persons, besides leaving a large area in the middle of the room. The orchestra is at the upper end, and is terminated by an elegant organ.

The musical society was first instituted in the year 1728. Before that time, several gentlemen had formed a weekly club at a tavern kept by one Steil, a great lover of music, and a good singer of Scots songs. Here the common entertainment consisted in playing on the harpichord and violin the concertos and sonatas of Handel, just then published. The meeting, however, soon becoming numerous, they instituted, in the year above mentioned, a society of 70 members, for the purpose of holding a weekly concert. The affairs of the society are regulated by a governor, deputy-governor, treasurer, and five directors, who are annually chosen by the members. The meetings have been continued ever since that time on much the same footing as at first, and the number of members is now increased to 200. The weekly concerts are on Friday; the tickets being given gratis by the directors, and attention paid in the first place to strangers. Oratorios are occasionally performed throughout the year; and the principal performers have also benefit concerts. The band are excellent in their several departments; and several of the members are also good performers, and take their part in the orchestra. There are always many applications on the occasion of a vacancy by the death of any of the members or otherwise; and such is generally the number of candidates, that it is no easy matter to get in.

10. *The University*. In the year 1581, a grant was obtained from king James VI. for founding a college or university within the city of Edinburgh; and the citizens, aided by various donations from well disposed persons, purchased a situation for the intended new college, consisting of part of the areas, chambers, and church of the collegiate provostry and prebends of the Kirk-a-field, otherwise called *Templum et Præfectura Sanctæ Mariæ in campis*, lying on the south side of the city. Next year, a charter of confirmation and erection was obtained also from king James VI. from which the college to be built did afterwards derive all the privileges of an university.

In 1583, the provost, magistrates, and council, the patrons of this new institution, prepared the place in the best manner they could for the reception of teachers and students; and in the month of October
N^o 108.

the same year, Robert Rollock, whom they had invited from a professorship in St Salvator's College in the university of St Andrew's, began to teach in the new college of Edinburgh. Other professors were soon after elected; and in the year 1586, Rollock was appointed principal of the college, and the following year also professor of divinity, immediately after he had conferred the degree of M. A. on the students who had been under his tuition for four years. The offices of principal and professor of divinity remained united till the year 1620.

In the 1617, king James VI. having visited Scotland after his accession to the crown of England, commanded the principal and regents of the college of Edinburgh to attend him in Stirling castle; and after they had there held a solemn philosophical disputation in the royal presence, his majesty was so much satisfied with their appearance, that he desired their college for the future might be called *The College of King James*, which name it still bears in all its diplomas or public deeds.

For several years the college consisted only of a principal, who was also professor of divinity, with four regents or professors of philosophy. Each of these regents instructed one class of students for four years, in Latin, Greek, school logic, mathematics, ethics, and physics, and graduated them at the conclusion of the fourth course. A professor of humanity or Latin was afterwards appointed, who prepared the students for entering under the tuition of the regents; also a professor of mathematics, and a professor of Hebrew or Oriental languages. It was not till about the year 1710 that the four regents began to be confined each to a particular profession; since which time they have been commonly styled *Professors of Greek, Logic, Moral, Philosophy, and Natural Philosophy*.—The first medical professors instituted at Edinburgh, were Sir Robert Sibbald and Doctor Archibald Pitcairn, in the year 1685*. These, however, were only titular professors; and for 30 years afterwards, a summer-lecture on the officinal plants, and the dissection of a human body once in two or three years, completed the whole course of medical education at Edinburgh.—In 1720, an attempt was made to teach the different branches of physic regularly; which succeeded so well, that, ever since, the reputation of the university as a school for medicine hath been constantly increasing, both in the island of Britain, and even among distant nations.

The college is endowed with a very fine library, founded in 1580 by Mr Clement Little advocate, who bequeathed it to the town-council. They ordered a house to be built for it in the neighbourhood of St Giles's church, where it was for some time kept under the care of the eldest minister of Edinburgh, but was afterwards removed to the college. This collection is enriched, as well as others of a similar kind, by receiving a copy of every book entered in Stationer's hall, according to the statute for the encouragement of authors. Besides this, the only fund it has is the money paid by all the students at the university, except those of divinity, upon their being matriculated; and a sum of 5l. given by each professor at his admission. The amount of these sums is uncertain, but has been estimated at about 150l. annually. The students

See COL-
LEGE of
Physicians.

of

Edinburgh. of divinity, who pay nothing to this library, have one belonging to their own particular department.

Here are shown two skulls, one almost as thin as paper, pretended to be that of the celebrated George Buchanan, and, by way of contrast, another said to have been that of an idiot, and which is excessively thick. Here also are preserved the original protest against the council of Constance for burning John Huss and Jerom of Prague in 1417; the original contract of queen Mary with the dauphin of France, and some valuable coins and medals. There are also several portraits; particularly of Robert Pollock the first principal of the university, king James VI. Lord Napier the inventor of logarithms, John Knox, principal Carstairs, Mr Thomson the author of the Seasons, &c. The museum contains a good collection of natural curiosities, the number of which is daily increasing. The anatomical preparations are worth notice, as are also those belonging to the professor of midwifery.

The celebrity of this college has been greatly owing to the uniform attention of the magistracy in filling up the vacant chairs with men of known abilities in their respective departments. Greatly to their honour, too, they have been no less attentive to the instituting of new professorships from time to time as the public seemed to demand them. At present (anno 1790), the Senatus Academicus consists of the following members, arranged according to the different faculties.

Faculty of THEOLOGY.

William Robertson, D. D. Principal of the College.
Andrew Hunter, D. D. Professor of Divinity.
Thomas Hardy, D. D. Regius Professor of Church-History.
James Robertson, D. D. Professor of Oriental Languages, and Emeritus Secretary and Librarian.

Faculty of LAW.

Robert Dick, Advocate, Professor of Civil Law.
Allan Maconochie, Advocate, Professor of Public Law.
Alexander Fraser Tytler, Advocate, Professor of Universal Civil History, and of Greek and Roman Antiquities.
David Hume, Advocate, Professor of Scots Law.

Faculty of MEDICINE.

Alexander Monro, M. D. Professor of Medicine, and of Anatomy and Surgery.
James Gregory, M. D. Professor of the Practice of Physic.
Joseph Black, M. D. Professor of Medicine and Chemistry.
Francis Home, M. D. Professor of Medicine and Materia Medica.
Andrew Duncan, M. D. Professor of the Theory of Physic.
Daniel Rutherford, M. D. Professor of Medicine and Botany.
Alexander Hamilton, M. D. Professor of Midwifery.

Faculty of ARTS.

George Stewart, LL. D. Emeritus Professor of Humanity.
Adam Ferguson, LL. D. Emeritus Professor of Moral Philosophy, and joint Professor of Mathematics.

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Hugh Blair, D. D. Emeritus Professor of Rhetoric and Belles Lettres.

Andrew Dalziel, A. M. Professor of Greek, and Secretary and Librarian.

John Robison, A. M. Professor of Natural Philosophy.

Dugald Stewart, A. M. Professor of Moral Philosophy.

John Hill, LL. D. Professor of Humanity.

John Bruce, A. M. Joint Professor of Logic.

John Walker, D. D. Regius Professor of Natural History, and Keeper of the Museum.

William Greenfield, A. M. Professor of Rhetoric and Belles Lettres.

John Playfair, A. M. Professor of Mathematics.

Robert Blair, M. D. Regius Professor of Practical Astronomy.

James Finlayson, A. M. Joint Professor of Logic.

Andrew Coventry, M. D. Professor of Agriculture.

Andrew Fife, Principal Janitor and Macer.

William Stewart, under Janitor.

N. B. There are only about 50 bursters in this university, and these do not exceed 12l. *per annum*.

The number of students during the last session of the college, from October 10. 1789 to May 6. 1790, was nearly as follows:

Students of Divinity	-	130
———— Law	-	100
———— Physic	-	440
General Classes	-	420

In all 1090

The old buildings being very mean, and unfit for the reception of so many professors and students, and quite unsuitable to the dignity of such a flourishing university, as well as inconsistent with the improved state of the city, the Lord Provost, Magistrates, and Council, set on foot a subscription for erecting a new structure, according to a design of Robert Adam, Esq; architect. Part of the old fabric has in consequence been pulled down, and the new building is already in considerable forwardness. The foundation stone was laid on Monday the 16th of November, with great solemnity, by the Right Hon. Francis Lord Napier, grand master mason of Scotland, in the presence of the Right Hon. the Lord Provost, Magistrates, and Town-Council of the city of Edinburgh, with the Principal, Professors, and Students of the university of Edinburgh, a number of Nobility and Gentry, and the Masters, Officers, and Brethren, of all the lodges of free masons in the city and neighbourhood, who marched in procession from the Parliament-House down the High-Street. After the different masonic ceremonies were performed, two crystal-bottles, cast on purpose at the glass-house of Leith, were deposited in the foundation-stone. In one of these were put different coins of the present reign, each of them being previously enveloped in crystal, in such an ingenious manner, that the legend on the coins could be distinctly read without breaking the crystal. In the other bottle were deposited seven rolls of vellum, containing a short account of the original foundation and present state of the university, together with several other papers, in particular the different newspapers, containing advertisements relative to the college, &c. and a list of the names of the Principal and Professors, also of the present

Edinburgh present Lord Provost and Magistrates, and Officers of the grand lodge of Scotland. The bottles being carefully sealed up, were covered with a plate of copper wrapt in block tin; and upon the under side of the copper were engraved the arms of the city of Edinburgh and the university; likewise the arms of the Right Hon. Lord Napier, grand master mason of Scotland. Upon the upper side, a Latin inscription, of which the following is a copy:

ANNUENTE DEO OPT. MAX.
 REGNANTE GEORGIO III. PRINCIPE
 MUNIFICENTISSIMO;
 ACADEMIÆ EDINBURGENSIS
 ÆDIBUS,
 INITIO QUIDEM HUMILLIMIS,
 ET JAM, POST DUO SECULA, PENE RUINOSIS;
 NOVI HUIUS ÆDIFICII,
 UBI COMMODITATI SIMUL ET ELEGANTIÆ,
 TANTO DOCTRINARUM DOMICILIO
 DIGNÆ,
 CONSULERETUR,
 PRIMUM LAPIDEM POSUIT,
 PLAUDENTE INGENTI OMNIUM ORDINUM
 FREQUENTIA,
 VIR NOBILISSIMUS
 FRANCISCUS DOMINUS NAPIER,
 REIPUB. ARCHITECTONICÆ APUD SCOTOS
 CURIO MAXIMUS:
 XVI. KAL. DECEMB.
 ANNO SALUTIS HUMANÆ MDCCLXXXIX.
 ÆRÆ ARCHITECTONICÆ MDCCCLXXXIX.
 CONSULE THOMA ELDER,
 ACADEMIÆ PRÆFECTO GULIELMO
 ROBERTSON,
 ARCHITECTO ROBERTO ADAM.
 Q. F. F. Q. S.

The east and west fronts of this pile are to extend 255 feet, and the south and north 358. There are to be houses for the principal and six or seven of the professors. The library is to be a room of 160 feet in length; the museum for natural curiosities is to be of the same extent; and the dimensions of the hall for degrees and public exercises are about 90 feet by 30. There are likewise to be an elegant and most convenient anatomical theatre; a chemical laboratory; and large rooms for instruments and experiments for the professors of mathematics, natural philosophy, and agriculture. The whole when finished, if not the most splendid structure of the sort in Europe, will however be the completest and most commodious; and it will do the utmost honour to the genius of the architect and to the munificence of the public. About L. 16,000 is already subscribed; and there is no doubt that the aid of parliament will be granted to complete the work.

The botanical garden belonging to the university is situated at the distance of about a mile, on the road between Edinburgh and Leith. It consists of about five acres of ground; and is furnished with a great variety of plants, many of them brought from the most distant quarters of the globe. The professor is botanist to the king, and receives a salary of 120l. annually for the support of the garden. A monument, to the memory of the celebrated botanist Linnæus, was erected here by the late Dr Hope, who first planned the garden, and brought it to perfection.

The university of Edinburgh, like the others in this kingdom, sends one member to the General Assembly of the church of Scotland; and the widows of the professors have a right to the funds of those of ministers, the professors being trustees on that fund along with the presbytery of Edinburgh.

11. *The Royal Infirmary* was first thought of by the college of physicians in 1725. A fishing company happening to be dissolved at that time, the partners contributed some of their stock towards the establishment of the infirmary. A subscription was also set on foot, and application made to the General Assembly to recommend the same throughout their jurisdiction. This was readily complied with, and the assembly passed an act for that purpose; but very little regard was paid to it by the clergy. Notwithstanding this, however, 2000l. being procured, a small house was opened for the reception of the sick poor in August 1729. In 1736, the contributors towards the infirmary were erected into a body corporate by royal statute; and after this the contributions increased very considerably: by which means the managers were enabled to enlarge their scheme from time to time; and at last to undertake the present magnificent structure, the foundation of which was laid in 1738. During 25 years, when this institution was in its infancy, Lord Hopetoun bestowed upon it an annuity of 400l. In 1750, Doctor Archibald Ker bequeathed to this incorporation 200l. a-year in the island of Jamaica. In 1755, the lords of the treasury made a donation to it of 8000l. which had been appointed for the support of invalids. In return for this, the managers of the infirmary constantly keep 60 beds in readiness for the reception of sick soldiers. This year also sick servants began to be admitted into the infirmary, and a ward was fitted up for their reception.

This institution, however, was more indebted to George Drummond, Esq; than to any other person. He was seven times chosen lord provost of Edinburgh; and always directed his attention to the improvement of the city, particularly to that of the royal infirmary. So sensible were the managers of their obligations to him, that, in their hall, they erected a bust of him with this inscription, "George Drummond, to whom this country is indebted for all the benefit which it derives from the Royal Infirmary."—In 1748, the stock of the infirmary amounted to 5000l; in 1755, to 7076l. besides the estate left by Doctor Ker; in 1764, to 23,426l.; and in 1778, to 27,074l.

The royal infirmary is attended by two physicians chosen by the managers, who visit their patients daily in presence of the students. All the members of the college of surgeons are also obliged to attend in rotation, according to seniority. If any surgeon declines attendance, he is not allowed to appoint a depute; but the patients are committed to the care of one of four assistant surgeons, chosen annually by the managers.—From the year 1762 to 1769, there were admitted 6261 patients; which number added to 109 who were in the hospital at the commencement of the year 1762, made, in all, 6370. Of these, 4395 were cured; 358 died; the rest were either relieved, dismissed incurable, for irregularities, or by their own desire, or remained in the hospital.—From 1770 to 1775, the patients annually admitted into the infirmary were, at an average, 1567; of whom 63 died. In 1776, there were admitted 1668,

Edinburgh. of whom 57 died; and in 1777, the number admitted was 1593, and of deaths 52. In the year 1786, there were admitted 1822 patients: Of these 1354 were cured; 166 relieved; 84 died; the rest were either relieved, dismissed incurable, for irregularities, or by their own desire.

The building consists of a body and two wings, each of them three stories high, with an attic story and garrets, and a very elegant front. The body is 210 feet long, and 36 broad in the middle, but at the ends only 24 feet broad. There is a bust of king George II. in a Roman dress, above the great door. The wings are 70 feet long, and 24 broad. In the centre is a large stair-case, so wide that sedan chairs may be carried up. In the different wards, 228 patients may be accommodated, each in a different bed. There are cold and hot baths for the patients, and also for the citizens; and to these last the patients are never admitted.

Besides the apartments necessary for the sick, there are others for the officers and servants belonging to the house. There are likewise rooms for the managers, a consulting room for the physicians and surgeons, a waiting-room for the students, and a theatre that will hold upwards of 200 people for performing surgical operations. There is a military ward, supported by the interest of the 8000l. already mentioned; and in consequence of which a small guard is always kept at the infirmary. The wards for sick servants are supported by collections at the church doors. Besides the attendance of the royal college of surgeons by rotation, as has already been mentioned, there are two physicians belonging to the house, who are elected by the managers, and have a small salary; there is likewise a house-surgeon and apothecary. Students who attend the infirmary pay 3l. 3s. annually, which brings in a revenue of about 500l. towards defraying the expence of the house. Two wards are set apart for the patients whose cases are supposed to be most interesting; and the physicians give lectures upon them.

12. *The Public Dispensary* was founded by Dr Duncan in 1776, for the poor whose diseases are of such a nature as to render their admission into the infirmary either unnecessary or improper. Here the patients receive advice gratis four days in the week; a register is kept of the diseases of each, and of the effects produced by the medicines employed. All patients not improper for dispensary treatment are admitted on the recommendation of the elder or church-warden of the parish where they reside. The physicians officiate and give lectures gratis; so that the apothecary who lodges in the house, and the medicines, are the only expences attending this useful institution. The expence of the whole is defrayed by public contributions, and from a small annual fee paid by the students who attend the lectures. It is under the direction of a president, two vice-presidents, and 20 directors, elected annually from among the contributors. One guinea intitles a contributor to recommend patients and be a governor for two years, and five guineas gives the same privilege for life.

13. *The High School.* The earliest institution of a grammar-school in Edinburgh seems to have been a-

bout the year 1519. The whole expence bestowed upon the first building of this kind amounted only to about 40l. Sterling. Another building, which had been erected for the accommodation of the scholars in 1578, continued, notwithstanding the great increase of their number, to be used for that purpose till 1777. The foundation of the present new building was laid on the 24th of June that year by Sir William Forbes, Grand Master of the Free Masons. The total length of this building is 120 feet from south to north; the breadth in the middle 36, at each end 38 feet. The great hall where the boys meet for prayers, is 68 feet by 30. At each end of the hall is a room of 32 feet by 20, intended for libraries. The building is two stories high, the one 18, the other 17, feet in height. The expence of the whole when finished is reckoned at 4000l.

There is a rector and four masters, who teach from 4 to 500 scholars annually. The salaries are trifling, and the fees depend upon the reputation they have obtained for teaching; and as this has been for some years very considerable, the rector's place is supposed to be worth not less than 400l. *per annum*, a master's about half that sum. There is a janitor, whose place is supposed to be worth about 70l. a-year. His business is to take care of the boys on the play-ground; and there is a woman who lives on the spot as under janitor, whose place may be worth about 25l. annually. There is a library, but not large, as each of the boys pays only one shilling annually to its support.

There are four established English schools in Edinburgh; the masters of which receive a small salary, upon express condition that they shall not take above five shillings per quarter from any of their scholars. There are likewise many other private schools in Edinburgh for all languages; and, in general, every kind of education is to be had here in great perfection and at a very cheap rate.

14. *The Mint* is kept up by the articles of union, with all the offices belonging to it, though no money is ever struck here. It stands in the Cowgate, a little to the west of the English church; but is in a ruinous state, though still inhabited by the different officers, who have free houses; and the bell-man enjoys his salary by regularly ringing the bell. This place, as well as the abbey of Holyrood-house, is an asylum for debtors.

15. *The English Chapel* stands near the Cowgate port, and was founded on the 3d of April 1771. The foundation-stone was laid by general Oughton, with the following inscription: *Edifici sac. Ecclesie episc. Anglie, primum posuit lapidem J. Adolphus Oughton, in architectonica Scotie repub. curio maximus, militum prefectus, regnante Georgio III. tertio Apr. die, A. D. MDCCLXXI.* It is a plain handsome building, neatly fitted up in the inside, and somewhat resembling the church of St Martin's in the Fields, London. It is 90 feet long, 75 broad, and ornamented with an elegant spire of considerable height. It is also furnished with an excellent bell, formerly belonging to the chapel royal at Holyrood-house, which is permitted to be rung for assembling the congregation; an indulgence not granted to the Presbyterians in England. The expence of the building was defrayed by voluntary subscription;

Edinburgh and, to the honour of the country, people of all persuasions contributed to this pious work. It has already cost 7000*l.* and will require 1000*l.* more to finish the portico. This church is built in a singular manner, viz. from south to north, and the altar-piece stands on the east side. Three clergymen officiate here, of whom the first has 150*l.* the other two 100*l.* each. The altar-piece is finely decorated, and there is a good organ.

There is another Episcopal chapel, but small, in Black-fryars wynd, which was founded by Baron Smith in the year 1722. There are also some meetings of the Episcopal church of Scotland, who adhere to their old forms, having still their bishops and inferior clergy. For some time these were subjected to penal laws, as they refused to take the oath to government, or mention the present royal family in their public prayers: but of late they have conformed, and had their conduct approved of by his Majesty; so that now every denomination of Christians in Britain pray for the royal family on the throne.

16. *Heriot's Hospital* owes its foundation to George Heriot, goldsmith to James VI. who acquired by his business a large fortune. At his death, he left the magistrates of Edinburgh 23,625*l.* 10*s.* "for the maintenance, relief, and bringing up of so many poor and fatherless boys, freemens sons of the town of Edinburgh," as the above sum should be sufficient for. This hospital is finely situated on the west end of the south ridge, almost opposite to the castle, and is the most magnificent building of the kind in Edinburgh. It was founded in July 1628, according to a plan (as is reported) of Inigo Jones; but the work being interrupted by the civil wars, it was not finished till the year 1650. The expence of the building is said to have been upwards of 30,000*l.* (A): and the hospital is now possessed of an income of about 3000*l.* a-year; though this cannot be absolutely ascertained, as the rents are paid in grain, and of course must be fluctuating.

It stands on a rising ground to the south-west of the city, and is a square of 162 feet without, having a court 94 feet square in the inside, with piazzas on three of the sides. There is a spire with a clock over the gateway, and each corner of the building is ornamented with turrets; but notwithstanding the magnificent appearance of the outside, the inner part is far from being convenient. There is a statue of the founder over the gateway, in the dress of the times, and a very good painting of him in the governor's room, with a picture of the late treasurer Mr Carmichael. There is a chapel 61 feet long and 22 broad, which is now repairing in such a manner as will make it worthy of notice. When Cromwell took possession of Edinburgh after the battle of Dunbar, he quartered his sick and wounded soldiers in this hospital. It was

applied to the same purpose till the year 1658, when Edinburgh general Monk, at the request of the governors, removed the soldiers; and on the 11th of April 1659, it was opened for the reception of boys, 30 of whom were admitted into it. The August after, they were increased to 40; and in 1661, to 52. In 1753 the number was raised to 130, and in 1763 to 140; but since that time it has decreased.—In this hospital the boys are instructed in reading, writing, arithmetic, and a knowledge of the Latin tongue. With such as choose to follow any kind of trade, an apprentice-fee of 30*l.* is given when they leave the hospital; and those who choose an academical education, have an annuity of 10*l.* a-year bestowed on them for four years. The whole is under the oversight of the treasurer, who has under him a house-governor, house-keeper, and school-masters.

17. *Watson's Hospital* has its name from the founder George Watson, who was at first clerk to Sir William Dick provost of Edinburgh in 1676, then accountant of the bank of Scotland; after that he became receiver of the city's impost on ale, treasurer to the Merchant's Maiden Hospital, and to the society for propagating Christian knowledge. Dying a bachelor in 1723, he left 12,000*l.* for the maintenance and education of the children and grand-children of decayed members of the merchant company of Edinburgh. The scheme, however, was not put in execution till the year 1738, when the sum originally left had accumulated to 20,000*l.* The present building was then erected, in which about 60 boys are maintained and educated. It is much less magnificent than Heriot's hospital, but the building is far from being despicable. It stands to the southward of the city at a small distance from Heriot's hospital, and was erected at the expence of 5000*l.*: its present revenue is about 1700*l.* It is under the management of the master, assistants, and treasurer of the Merchant Company, four old bailies, the old dean of guild, and the two ministers of the old church. The boys are genteelly clothed and liberally educated. Such as choose an university education are allowed 10*l.* *per annum* for five years: those who go to trades have 20*l.* allowed them for their apprentice fee; and at the age of 25 years, if they have behaved properly, and not contracted marriage without consent of the governors, they receive a bounty of 50*l.* The boys are under the immediate inspection of the treasurer, school-master, and house-keeper.

18. *The Merchants Maiden Hospital* was established by voluntary contribution about the end of the last century, for the maintenance of young girls, daughters of the merchants burghesses of Edinburgh. The governors were erected into a body corporate, by act of parliament, in 1707. The annual revenue amounts to 1350*l.* Seventy girls are maintained in it; who, upon leaving the house, receive 3*l.* 6*s.* 8*d.* excepting

(A) It is to be observed, that money then bore 10*l.* *per cent.* interest.—The above sums are taken from Mr Arnot's History of Edinburgh, who subjoins the following note. "Where Maitland had collected his most erroneous account of George Heriot's effects, we do not know. He makes the sum received, out of Heriot's effects, by the governors of the hospital, to be 43,608*l.* 11*s.* 3*d.* being almost the double of what they really got. This blunder has been the cause of many unjust murmurings against the magistrates of Edinburgh, and even the means of spiriting up law-suits against them."

Edinburgh. a few who are allowed 8l. 6s. 8d. out of the funds of the hospital. The profits arising from work done in the house are also divided among the girls, according to their industry.

19. *The Trades Maiden Hospital* was founded in the year 1704 by the incorporations of Edinburgh, for the maintenance of the daughters of decayed members, on a plan similar to that of the merchants hospital. To this, as well as to the former, one Mrs Mary Erskine, a widow gentlewoman, contributed so liberally, that she was by the governors styled *joint foundress* of the hospital. Fifty girls are maintained in the house, who pay of entry-money 1l. 13s. 4d.; and, when they leave it, receive a bounty of 5l. 11s. 1½d. The revenues are estimated at 600l. a-year.

20. *The Orphan Hospital* was planned in 1732 by Andrew Gairdner merchant, and other inhabitants. It was promoted by the society for propagating Christian knowledge, by other societies, by voluntary subscriptions, and a collection at the church-doors.—In 1733, the managers hired a house, took in 30 orphans, maintained them, gave them instructions in reading and writing, and taught them the weaving business. In 1735, they were erected into a body corporate by the town of Edinburgh: and, in 1742, they obtained a charter of erection from his late majesty, appointing most of the great officers of state in Scotland, and the heads of the different societies in Edinburgh, members of this corporation; with powers to them to hold real property to the amount of 1000l. a-year. The revenue is inconsiderable; but the institution is supported by the contributions of charitable persons. Into this hospital orphans are received from any part of the kingdom. None are admitted under seven, nor continued in it after 14 years of age. At present (1790) about 140 orphans are maintained in it.

The orphan hospital is situated to the east of the north bridge; and is a handsome building, consisting of a body and two wings, with a neat spire, furnished with a clock and two bells. The late worthy Mr Howard admits, that this institution is one of the most useful charities in Europe, and is a pattern for all institutions of the kind. The funds have been considerably increased, and the building greatly improved, through the attention and exertions of Mr Thomas Tod the present treasurer.

21. *The Trinity Hospital*. This was originally founded and amply endowed by king James II.'s queen. At the Reformation, it was stripped of its revenues; but the regent afterwards bestowed them on the provost of Edinburgh, who gave them to the citizens for the use of the poor. In 1585, the town-council purchased from Robert Pont, at that time provost of Trinity college, his interest in these subjects; and the transaction was afterwards ratified by James VI. The hospital was then repaired, and appointed for the reception of poor old burghesses, their wives, and unmarried children, not under 50 years of age. In the year 1700, this hospital maintained 54 persons; but, since that time, the number has decreased.—The revenue consists in a real estate of lands and houses, the gross rent of which are 762l. a-year; and 5500l. lent out in bonds at 4 per cent.

This hospital is situated at the foot of Leith-wynd, and maintains about 50 of both sexes, who are com-

fortably lodged, each having a room for themselves. Edinburgh. They are supplied with roast or boiled meat every day for dinner, have money allowed them for clothes, and likewise a small sum for pocket-money. There is a small library for their amusement, and they have a chaplain to say prayers. There are some out-pensioners who have 6l. a-year, but these are discouraged by the governors. The funds are under the management of the town-council.

22. *The Charity Workhouse* was erected in 1743 by voluntary contribution. It is a large plain building, on the south side of the city. Here the poor are employed, and are allowed twopence out of every shilling they earn. The expence of this institution is supposed not to be less than 4000l. annually; as about 700 persons of both sexes, including children, are maintained here, each of whom cannot be reckoned to cost less than 4l. 10s. *per annum*; and there are besides 300 out-pensioners. The only permanent fund for defraying this expence is a tax of two *per cent.* on the valued rents of the city, which may bring in about 600l. annually; and there are other funds which yield about 400l. The rest is derived from collections at the church doors and voluntary contributions; but as these always fall short of what is requisite, recourse must frequently be had to extraordinary collections. The sum arising from the rents of the city, however, is constantly increasing; but the members of the College of Justice are exempted from the tax.

There are two other charity workhouses in the suburbs, much on the same plan with that now described; one in the Canongate, and the other in St Cuthbert's or West Kirk parish.

To this account of the charitable establishments in Edinburgh, we shall add that of some others; which, though not calculated to decorate the city by any public building, are perhaps no less deserving of praise than any we have mentioned. The first is that of Captain William Horn; who left 3500l. in trust to the magistrates, the annual profits to be divided on Christmas day to poor out-day labourers, who must at that season of the year be destitute of employment; five pounds to be given to those who have large families, and one half to those who have smaller.

Another charity is that of Robert Johnston, L.L.D. of London, who in 1640 left 3000l. to the poor of this city; 1000l. to be employed in setting them to work, another 1000l. to clothe the boys in Heriot's Hospital, and the third 1000l. to bursars at the university.

About the beginning of this century John Strachen left his estate of Craigcrook, now upwards of 300l. a-year, in trust to the presbytery of Edinburgh, to be by them disposed of in small annual sums to poor old people not under 65 years of age, and to orphans not above 12.

There is besides a society for the support of the industrious poor, another for the indigent sick, and there are also many charity-schools.

Having thus given an account of the most remarkable edifices belonging to Old Edinburgh, we shall now proceed to those of the New Town. This is terminated on the east side by the Calton-hill, round which there is a pleasant walk, and which affords one of the finest prospects that can be imagined, varying

Edinburgh. varying remarkably almost at every step. On this hill is a burying-ground, which contains a fine monument to the memory of David Hume the historian.—On the top is an Observatory, the scheme for building which was first adopted in the year 1736; but the disturbance occasioned by the Porteous mob prevented any thing from being done towards the execution of it at that time. The Earl of Morton afterwards gave 100 l. for the purpose of building an observatory, and appointed Mr M'Laurin professor of mathematics, together with the principal and some professors of the university, trustees for managing the sum. Mr M'Laurin added to the money above mentioned the profits arising from a course of lectures which he read on experimental philosophy; which, with some other small sums, amounted in all to 300 l.: but Mr M'Laurin dying, the design was dropped.—Afterwards the money was put into the hands of two persons who became bankrupt; but a considerable dividend being obtained out of their effects, the principal and interest, about the year 1776, amounted to 400 l. A plan of the building was made out by Mr Craig architect; and the foundation-stone was laid by Mr Stodart, lord provost of Edinburgh, on the 25th of August 1776. About this time, however, Mr Adam architect happening to come to Edinburgh, conceived the idea of giving the whole the appearance of a fortification, for which its situation on the top of the Calton-hill was very much adapted. Accordingly a line was marked out for inclosing the limits of the observatory with a wall constructed with buttresses and embrasures, and having Gothic towers at the angles. Thus the money designed for the work was totally exhausted, and the observatory still remains unfinished; nor is there any appearance of its being soon completed either by voluntary subscription or any other way.

23. Proceeding to the westward, the first remarkable building is the *Theatre*, which stands opposite to the Register Office, in the middle of Shakespeare Square. The building is plain on the outside, but elegantly fitted up within, and is generally open three days in the week, and when full will draw about 150 l. a-night; so that the manager generally finds himself well rewarded when he can procure good actors.

Entertainments of the dramatic kind came very early into fashion in this country. They were at first only representations of religious subjects, and peculiarly designed to advance the interests of religion; the clergy being the composers, and Sunday the principal time of exhibition. In the 16th century, the number of playhouses was so great, that it was complained of as a nuisance, not only in Edinburgh, but throughout the kingdom. They soon degenerated from their original institution; and the plays, instead of being calculated to inspire devotion, became filled with all manner of buffoonery and indecency.—After the Reformation, the Presbyterian clergy complained of these indecencies; and being actuated by a spirit of violent zeal, anathematized every kind of theatrical representation whatever. King James VI. compelled them to pass from their censures against the stage; but in the time of Charles I. when fanaticism was carried to the utmost length at which perhaps it was possible for it to arrive, it cannot be supposed that stage plays would be tolera-

ted.—It seems, however, that amusements of this Edinburgh kind were again introduced at Edinburgh about the year 1684, when the Duke of York kept his court there. His residence at Edinburgh drew off one half of the London company, and plays were acted in Edinburgh for some little time. The misfortunes attending the Duke of York, however, and the establishment of the Presbyterian religion (the genius of which is unfavourable to amusements of this kind), soon put a stop to the progress of the stage, and no theatrical exhibition was heard of in Edinburgh till after the year 1715. The first adventurer was Signora Violante, an Italian, remarkable for feats of strength, tumbling, &c. In this way she first exhibited in a house at the foot of Carrubber's Close, which has since been employed by different sectaries for religious purposes. Meeting with good success, she soon invited a company of comedians from London; and these being also well received, Edinburgh continued for some years to be entertained with the performances of a strolling company, who visited it annually. Becoming at last, however, obnoxious to the clergy, they were in 1727 prohibited by the magistrates from acting within their jurisdiction. But this interdict was suspended by the Court of Session, and the players continued to perform as usual.

Still, however, theatrical entertainments were but rare. The town was visited by itinerant companies only once in two or three years. They performed in the Taylor's Hall in the Cowgate; which, when the house was full, would have drawn (at the rate of 2s. 6d. for pit and boxes, and 1s. 6d. for the gallery) 40l. or 45 l. a-night. About this time an act of parliament was passed, prohibiting the exhibition of plays, except in a house licensed by the king. Of this the presbytery of Edinburgh immediately laid hold; and at their own expence brought an action on the statute against the players. The cause was by the Court of Session decided against the players; who thereupon applied to parliament for a bill to enable his majesty to license a theatre in Edinburgh. Against this bill petitions were presented in 1739 to the house of commons by the magistrates and town-council, the principal and professors of the university, and the dean of guild and his council; in consequence of which, the affair was dropped. All this opposition, however, contributed in reality to the success of the players; for the spirit of party being excited, a way of evading the act was easily found out, and the house was frequented more than usual, insomuch that Taylor's Hall was found insufficient to contain the number of spectators.

The comedians now fell out among themselves, and a new playhouse was erected in the Canongate in the year 1746. The consequence of this was, that the old one in Taylor's Hall became entirely deserted, and through bad conduct the managers of the new theatre soon found themselves greatly involved. At last, a riot ensuing through dissensions among the performers, the playhouse was totally demolished.—When the extension of the royalty over the spot where the New Town is built was obtained, a clause was likewise added to the bill, enabling his majesty to license a theatre in Edinburgh. This was obtained, and thus the opposition of the clergy for ever silenced. But notwithstanding this,

Edinburgh. this, the high price paid by the managers to the patentee, being no less than 500 guineas annually, prevented them effectually from decorating the house as they would otherwise have done, or even from always retaining good actors in their service; by which means the success of the Edinburgh theatre has not been so great as might have been expected.

Not far from this building, an amphitheatre was opened in 1790, on the road to Leith, for equestrian exhibitions, pantomime entertainments, dancing, and tumbling. The circus is 60 feet diameter; and in the forenoon ladies and gentlemen are taught to ride. The house will hold about 1500 people.

24. *The Register Office.* This work was first suggested by the late Earl of Morton, lord-register of Scotland, with a view to prevent the danger which attended the usual method of keeping the public records. In former times, indeed, these suffered from a variety of accidents. Edward I. carried off or destroyed most of them, in order to prevent any marks of the former independency of the nation from remaining to posterity. Afterwards Cromwell spoiled this nation of its records, most of which were sent to the tower of London. At the time of the Restoration, many of them were sent down again by sea; but one of the vessels was shipwrecked, and the records brought by the other have ever since been left in the greatest confusion.—The Earl of Morton taking this into consideration, obtained from his majesty a grant of 12,000l. out of the forfeited estates, for the purpose of building a register-office, or house for keeping the records, and disposing them in proper order. The foundation was laid on the 27th of June 1774, by Lord Frederic Campbell lord-register, Mr Montgomery of Stanhope lord advocate, and Mr Miller of Barskimming lord justice-clerk; three of the trustees appointed by his majesty for executing the work. The ceremony was performed under a discharge of artillery, in presence of the judges of the courts of session and exchequer, and in the sight of a multitude of spectators. A brass plate was put into the foundation-stone with the following inscription: CONSERVANDIS TABULIS PUBLICIS POSITUM EST, ANNO M.DCC.LXXIV, MUNIFICENTIA OPTIMI ET PIETISSIMI PRINCIPIS GEORGII TERTII. In a glass vase hermetically sealed, which is also placed in the foundation-stone, are deposited specimens of the different coins of his present majesty.

The front of the building directly faces the bridge, extends from east to west 200 feet, and is 40 feet back from the line of Prince's-street. In the middle of the front is a small projection of three windows in breadth. Here is a pediment, having in its centre the arms of Great Britain, and the whole is supported by four Corinthian pilasters. At each end is a tower projecting beyond the rest of the building, having a Venetian window in front, and a cupola on the top. The front is ornamented from end to end with a beautiful Corinthian entablature. In the centre of the building is a dome of wooden work covered with lead. The inside forms a saloon 50 feet diameter and 80 high, lighted at top by a copper window 15 feet in diameter. Round the whole is a hanging gallery of stone, with an iron balustrade, which affords conveniency for presses in the walls for keeping the records. The whole number of apartments is 97; all of which are vaulted beneath,

and warmed with fire-places. This building, which is the most beautiful of Mr Adams's designs, has been executed in a substantial manner, in about 16 years, at the expence of near 40,000l. and is one of the principal ornaments of the city. A serjeant's guard is placed here from the castle, for the further protection of the records. It is intended to place a statue of his present Majesty in the front of the building, with the lion and unicorn above the centinels boxes. The lord-register has the direction of the whole, and the principal clerks of Session are his deputies. These have a great number of clerks under them for carrying on the business of the Court of Session. The lord-register is a minister of state in this country. He formerly collected the votes of the parliament of Scotland, and still collects those of the peers at the election of 16 to represent them in parliament.

25. On the east side of St Andrew's Square stands the *General Excise Office*, built by the late Sir Laurence Dundas for his own residence, but sold by his son for the above purpose. It is a very handsome building, with a pediment in front ornamented with the king's arms, and supported by four Corinthian pilasters; and, in conjunction with the two corner houses, has a fine effect.

26. *St Andrew's Church* stands on the north side of George's Street. It is of an oval form; and has a very neat spire of 186 feet in height, with a chime of eight bells, the first and only one of the kind in Scotland. It has also a handsome portico in front.

27. Opposite to St Andrew's church is the *Physicians Hall*, designed for the meetings of the faculty, and which has a portico resembling that of the church.

28. Farther to the westward, on the south side, stand the *Assembly-rooms*, which though a heavy looking building on the outside, are nevertheless extremely elegant and commodious within. The largest is 100 feet long and 40 broad, being exceeded in its dimensions by none in the island, the large one at Bath excepted. Weekly assemblies are held here for dancing and card-playing, under the direction of a master of ceremonies; admission-tickets five shillings each.

It now remains only to speak something of the religious and civil establishments of this metropolis. The highest of the former is the General Assembly of the Church of Scotland, who meet here annually in the month of May, in an aisle of the church of St Giles fitted up on purpose for them. The throne is filled by a commissioner from his majesty, but he neither debates nor votes. He calls them together, and dissolves them at the appointed time in the name of the king; but they call and dissolve themselves in the name of the Lord Jesus Christ. This assembly consists of 350 members chosen out of the various presbyteries throughout the kingdom; and the debates are often very interesting and eloquent. This is the supreme ecclesiastical court in Scotland, to which appeals lie from the inferior ones.

The ecclesiastical court next in dignity to the assembly is the Synod of Lothian and Tweeddale, who meet in the same place in April and November; and next to them is the Presbytery of Edinburgh. These meet on the last Wednesday of every month, and are trustees on the fund for ministers widows. They have

Edinburgh. a hall in Scott's close, where there is a good picture of Dr Webster by Martin, which was put up at the expense of the trustees, out of gratitude for the trouble he took in planning and fully establishing the fund.

The Society for Propagating Christian Knowledge in the Highlands and Islands of Scotland, was established a body corporate by queen Anne in the year 1709, for the purpose of erecting schools to instruct poor children in the principles of Christianity, as well as in reading and writing. The society have a hall in Warriston's close where their business is transacted. From time to time they have received large contributions, which have always been very properly applied; and for much the same purpose his majesty gives 1000*l.* annually to the general assembly of the church of Scotland, which is employed by a committee of their number for instructing the poor Highlanders in the principles of the Christian religion.

The Earle church at Edinburgh was built about 20 years ago by subscription for the same laudable purpose. Great numbers of people resort to the metropolis from the Highlands, who understand no other language but their own, and consequently have no opportunity of instruction without it; and a most remarkable proof of the benefit they have received from it is, that though the church is capable of holding 1000 people, yet it is not large enough for those who apply for seats. The minister has 100*l. per annum* arising from the seat-rents, and holds communion with the church of Scotland. The establishment was promoted by William Dickson dyer in Edinburgh.

30
Political
constitu-
tion.

With regard to the political constitution of Edinburgh, the town-council have the direction of all public affairs. The *ordinary* council consists only of 25 persons; but the *council ordinary and extraordinary*, of 33. The whole is composed of merchants and tradesmen, whose respective powers and interests are so interwoven, that a balance is preserved between the two bodies. The members of the town-council are partly elected by the members of the 14 incorporations, and they partly choose their own successors. The election is made in the following manner: First a list or *leet* of six persons is made out by each incorporation; from which number, the deacon belonging to that incorporation must be chosen. These lists are then laid before the ordinary council of 25, who "shorten the *leets*," by expunging one half of the names from each; and from the three remaining ones the deacon is to be chosen. When this election is over, the new deacons are presented to the ordinary council, who choose six of them to be members of their body, and the six deacons of last year then walk off. The council of 25 next proceed to the election of three merchant and two trades counsellors. The members of council, who now amount to 33 in number, then make out *leets*, from which the lord provost, dean of guild, treasurer, and bailies must be chosen. The candidates for each of these offices are three in number; and the election is made by the 30 members of council already mentioned, joined to the eight *extraordinary* council-deacons.

The lord provost of Edinburgh, who is styled *right honourable*, is high sheriff, coroner, and admiral, within the city and liberties, and the town, harbour, and road of Leith. He has also a jurisdiction in matters of life
N^o 108.

and death. He is preses of the convention of royal Edinburgh boroughs, colonel of the trained bands, commander of the city-guard and of Edinburgh jail. In the city he has the precedency of all the great officers of state and of the nobility; walking on the right hand of the king or of his majesty's commissioner; and has the privilege of having a sword and mace carried before him. Under him are four magistrates called *bailies*, whose office is much the same with that of aldermen in London. There is also a dean of guild, who has the charge of the public buildings, and without whose warrant no house nor building can be erected within the city. He has a council to consult with, a nominal treasurer, who formerly had the keeping of the town's money, which is now given to the chamberlain. These seven are elected annually; who with the seven of the former year, three merchants and two trades counsellors, and 14 deacons or preses of incorporated trades, making in all 33, form the council of the city, and have the sole management and disposal of the city revenues; by which means they have the disposal of places to the amount of 20,000*l.* annually. Formerly the provost was also an officer in the Scots parliament. The magistrates are sheriffs-depute and justices of the peace; and the town council are also patrons of all the churches in Edinburgh, patrons of the university, and electors of the city's representative in parliament. They have besides a very ample jurisdiction both civil and criminal. They are superiors of the Canongate, Portsburgh, and Leith; and appoint over these certain of their own number, who are called *baron bailies*: but the person who presides over Leith has the title of *admiral*, because he hath there a jurisdiction over maritime affairs. The baron bailies appoint one or two of the inhabitants of their respective districts to be their substitutes, and these are called *resident bailies*. They hold courts in absence of the baron-bailies, for petty offences, and discussing civil causes of little moment.

No city in the world affords greater security to the inhabitants in their persons and properties than Edinburgh. Robberies are here very rare, and a street-murder hardly known in the memory of man; so that a person may walk the streets at any hour of the night in perfect security. This is in a great measure owing to the *town-guard*. This institution originated from the con-³¹sternation into which the citizens were thrown after the battle at Flowden. At that time, the town-council commanded the inhabitants to assemble in defence of the city, and every fourth man to be on duty each night. This introduced a kind of personal duty for the defence of the town, called *watching and warding*; by which the trading part of the inhabitants were obliged in person to watch alternately, in order to prevent or suppress occasional disturbances. This, however, becoming in time extremely inconvenient, the town-council, in 1648, appointed a body of 60 men to be raised; the captain of which was to have a monthly pay of 11*l.* 2*s.* 3*d.* two lieutenants of 2*l.* each, two serjeants of 1*l.* 5*s.* and the private men of 15*s.* each. No regular fund was established for defraying this expence; the consequence of which was, that the old method of watching and warding was resumed: but the people on whom this service devolved were now become so relaxed in their discipline, that the magistrates were threatened with having the king's

Edinburgh. troops quartered in the city if they did not appoint a sufficient guard. On this 40 men were raised in 1679, and in 1682 the number was increased to 108. After the revolution, the town-council complained of the guard as a grievance, and requested parliament that it might be removed. Their request was immediately granted, and the old method of watching and warding was renewed. This, however, was now so intolerable, that the very next year they applied to parliament for leave to raise 126 men for the defence of the city, and to tax the citizens for their payment. This being granted, the corps was raised which still continues under the name of the *town-guard*. At present the establishment consists of three officers and about 90 men, who mount guard by turns. The officers have a lieutenant's pay; the sergeants, corporals, drummers, and common soldiers, the same with those of the army. Their arms are the same with those of the king's forces; but when called upon to quell mobs, they use Lochaber-axes, a part of the ancient Scottish armour now in use only among themselves.

32
Militia or
trained
bands.

The militia or trained band of the city consist of 16 companies of 100 men each. They were in use to turn out every king's birth-day; but only the officers now remain, who are chosen annually. They consist of 16 captains and as many lieutenants; the provost, as has already been mentioned, being the colonel.

The town-guard are paid chiefly by a tax on the trading people; these being the only persons formerly subject to watching and warding. This tax, however, amounts only to 1250*l.* and as the expence of the guard amounts to 1400*l.* the magistrates are obliged to defray the additional charge by other means.

33
Number of
inhabitants. The number of inhabitants in the city of Edinburgh is somewhat uncertain, and has been very variously calculated. By a survey made in the year 1775, it appears that the number of families in the city, Canongate, and other suburbs, and the town of Leith, amounted to 13,806. The difficulty therefore is to fix the number of persons in a family. Dr Price fixes this number at $4\frac{1}{6}$; Mr Maitland, at $5\frac{1}{3}$; and Mr Arnot, at 6: so that, according to this last gentleman, the whole number of inhabitants is 82,836; to which he thinks 1400 more may be added for those in the garrison, hospitals, &c. There are in Edinburgh 14 incorporations, capable of choosing their own deacons, viz. The royal college of surgeons; the corporations of goldsmiths, skinners, furriers, hammermen, wrights and masons, taylor, bakers, butchers, shoemakers, weavers, waukers, bonnet-makers, and merchant-company. The revenue of the city, arising partly from duties of different kinds, and partly from landed property, is estimated at about 10,000*l.* per annum.

34
Plenty of
provisions.

The markets of Edinburgh are plentifully supplied with all sorts of provisions. Fresh butcher-meat, as well as fowl and fish, if the weather permit, may be had every day; and no city can be better supplied with garden stuffs. The Edinburgh strawberries particularly are remarkably large and fine. A remarkable instance of the plenty of provisions with which Edinburgh is supplied was observed in the year 1779, when several large fleets, all of them in want of necessaries, arrived in the Forth, to the amount of

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about 500 sail, and having on board at least 20,000 men; yet the increased consumption of provisions, which certainly ensued upon the arrival of so many strangers, made not the least increase in the rate of the markets, insomuch that several victualling ships sent down by the navy-board returned without opening their hatches. The city-mills are let to the corporation of bakers in Edinburgh; and the bread made in the city is remarkable for its goodness.

Edinburgh is supplied with water brought for some miles in pipes, and lodged in two reservoirs, from whence it is distributed through the city both to public wells and private families. A revenue accrues to the town from the latter, which must undoubtedly increase in proportion as the city extends in magnitude.

There are but few merchants in Edinburgh, most of them residing at the port of Leith; so that the support of the city depends on the consumption of the necessaries as well as the superfluities of life. There are five different sorts of people on whom the shopkeepers, publicans, and different trades depend: 1. The people of the law, who are a very respectable body in the city. 2. The number of young people of both sexes who come to town for their education, many of the parents of whom come along with them. 3. The country gentlemen, gentlemen of the army and navy, and people who have made their fortunes abroad, &c. all of whom come to attend the public diversions, or to spend their time in such a manner as is most agreeable to them. 4. The vast concourse of travellers from all parts. 5. Most of the money drawn for the rents of country gentlemen is circulated among the bankers or other agents.

At Edinburgh there are excellent manufactures of linen and cambrics; there are also manufactures of paper in the neighbourhood, and printing is carried on very extensively. But for some time the capital branch about Edinburgh has been building: which has gone on, and still continues to do so, with such rapidity, that the city has been increased exceedingly in its extent; and it is not uncommon to see a house built in a few months, and even inhabited before the roof is quite finished.

EDITOR, a person of learning, who has the care of an impression of any work, particularly that of an ancient author: thus, Erasmus was a great editor; the Louvain doctors, Scaliger, Petavius, F. Sirmond, bishop Walton, Mr Hearne, Mr Ruddiman, &c. are likewise famous editors.

EDOM, or ESAU, the son of Isaac and brother of Jacob. The name of Edom, which signifies *red*, was given him, either because he sold his birth-right to Jacob for a mess of red pottage, or by reason of the colour of his hair and complexion. Idumea derives its name from Edom, and is often called in scripture the land of Edom. See the next article.

EDOM, or IDUMÆA (anc. geog.), a district of Arabia Petræa; a great part also of the south of Judæa was called Idumæa, because occupied by the Idumæans, upon the Jewish captivity, quite to Hebron. But the proper Edom or Idumæa appears not to have been very extensive, from the march of the Israelites, in which they compassed it on the south eastwards, till

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they

Edinburgh
||
Edom.

Edmund, they came to the country of the Moabites. Within this compass lies mount Hor, where Aaron died; marching from which the Israelites fought with king Arad the Canaanite, who came down the wilderness against them (Moses). And this is the extent of the *Idumea Propria*, lying to the south of the Dead Sea; but in Solomon's time extending to the Red Sea (1 Kings ix. 26.)

EDMUND I. and II. See (*History of*) ENGLAND.

Definition.

EDUCATION may be defined, that series of means by which the human understanding is gradually enlightened, and the dispositions of the human heart are formed and called forth between earliest infancy and the period when we consider ourselves as qualified to take a part in active life, and, ceasing to direct our views solely to the acquisition of new knowledge or the formation of new habits, are content to act upon the principles which we have already acquired.

Particulars comprehended under the definition.

This comprehends the circumstances of the child in regard to local situation, and the manner in which the necessities and conveniences of life are supplied to him; the degree of care and tenderness with which he is nursed in infancy; the examples set before him by parents, preceptors, and companions; the degree of restraint or licentiousness to which he is accustomed; the various bodily exercises, languages, arts, and sciences, which are taught him, and the method and order in which they are communicated; the moral and religious principles which are instilled into his mind; and even the state of health which he enjoys during that period of life.

3. Various modes of education have prevailed.

In different periods of society, in different climates, and under different forms of government, various institutions have naturally prevailed in the education of youth; and even in every different family, the children are educated in a different manner, according to the differences in the situation, dispositions, and abilities, of the parents. The education of youth being an object of the highest importance, has not only engaged the anxious care of parents, but has likewise often attracted the notice of the legislator and the philosopher. What our readers have therefore a right to expect from us on this article is, 1st, That we give an account of some of the most remarkable institutions for the education of youth which have been legally established or have accidentally prevailed among various nations and in various periods of society. 2dly, That we also give some account of the most judicious and the most fanciful plans which have been proposed by those authors who have written on the subject of education. And, lastly, that we venture to present them with the result of our own observations and recollections on this important head.

5. Education in a savage state.

In the infancy of society, very little attention can be paid to the education of youth. Before men have risen above a savage state, they are almost entirely the creatures of appetite and instinct. The impulse of appetite hurries them to propagate their species. The power of instinctive affection is often, though not always, so strong as to compel them to preserve and nurse the fruit of their embraces. But even when their wants are not so urgent, nor their hearts so destitute of feeling, as to prompt them to abandon their new-born infants to the ferocity of wild beasts or the severity of the elements, yet still their uncomfortable

and precarious situation, their ignorance of the laws of Education, nature, their deficiency of moral and religious principles, and their want of dexterity or skill in any of the arts of life, all these together must render them unable to regulate the education of their children with much attention or sagacity. They may relate to them the wild inconsistent tales in which all their notions concerning superior beings and all their knowledge of the circumstances and transactions of their ancestors are contained; they may teach them to bend the bow, to point their arrows, to hollow the trunk of a tree into a canoe, and to trace the almost imperceptible path of an enemy or a wild beast over dreary mountains or through intricate forests: but they cannot impress their minds with just ideas concerning their social relations, or concerning their obligations to a Supreme Being, the framer and upholder of nature: they teach them not to repress their irregular appetites, nor to restrain the sallies of passion when they exceed just bounds or are improperly directed; nor can they inform their understandings with very accurate or extensive views of the phenomena of nature. Besides, they know not how far implicit obedience to his parents commands is to be required of the boy or youth, nor how far he ought to be left to the guidance of his own reason or humour. Among savages the influence of parental authority soon expires, nor is the parent solicitous to maintain it. As the eagle expels his young from his lofty nest as soon as they become able to support themselves in the air; so the savage generally ceases to care for his child, or assume any power over him, as soon as he becomes capable of procuring the means necessary for his own subsistence. Savages being scarce connected by any social ties, being unacquainted with the restraint of civil laws, and being unable to contribute in any great degree to the maintenance or protection of one another; each individual among them, as soon as he attains that degree of strength and dexterity which may enable him to procure the necessities of life, stands single and alone, independent on others, and scorning to submit to their commands. The parent, conscious of his inability to confer any important benefits on his child, after he has advanced even a very short way towards manhood, no longer endeavours to controul his actions; and the child, proud of his independence, scarce submits to ask his parent's advice. And even before reaching this period of independence, so few are the benefits which parents can bestow (being confined to supplying the necessities of life, and communicating the knowledge of a very few of the rudest simplest arts), that children regard them with little deference, nor do they always insist on implicit submission. Want of natural affection, and consciousness of superior strength, often prompt the parent to abuse the weakness of his child. Yet though small the skill with which the savage can cultivate the understanding or form the dispositions of his child, though few the arts which he can teach him, and though not very respectful or submissive the obedience or deference which he requires; yet is there one quality of mind which the savage is more careful to inspire than those parents who are directed in educating their children by all the lights of civilized society. That quality is indeed absolutely necessary to fit the savage for his situation; without it, the day on which he ceased

Education ceased to enjoy the protection of his parents would most probably be the last day of his life: That quality is Fortitude. We may perhaps think, that the hardships to which the young savage is from the period of his birth unavoidably exposed, might be enough to inspire him with fortitude; but, as if these were insufficient, other means are applied to inspire him with what the Stoics have regarded as the first of virtues. He is compelled to submit to many hardships unnecessary, but from a view to this. Children are there called to emulate each other in bearing the severest torments. Charlevoix relates, that he has seen a boy and girl bind their arms together, place a burning coal between them, and try who could longest endure without shrinking the pain to which they thus exposed themselves.

6 The savage indebted chiefly to nature and circumstances for his education. Still, however, the young savage owes his education rather to nature and to the circumstances in which he is placed, and the accidents which befall him, than to the kindness or prudence of his parents. Nature has endowed him with certain powers of understanding, sentiments, sensations, and bodily organs; he has been placed in certain circumstances, and is exposed to a certain train of events; and by these means chiefly, not by the watchful industry of instructors, does he become such as he appears when he has reached the years of maturity.

7 Education in an improved state of society. But man was not designed by his wife and beneficent Creator to remain long in a savage state; the principles of his nature incline him to social life. Reason, distinguishing the superior advantages to be enjoyed in society, concurs with the social principle in his breast, in prompting him to seek the company and conversation of others of the human race. When men enter into society, they always unite their powers and talents, in a certain degree, for the common advantage of the social body. In consequence of this, laws come in time to be instituted; new arts are invented; progress is made in the knowledge of nature; moral duties are better understood and defined; juster ideas are gradually acquired of all our social relations; friendship, love, filial, parental, and conjugal affection, all are heightened and refined. All these advantages do not instantly result from men entering into a social state; the improvement of the human mind, and the civilization of society, are gradual and progressive: But as it is natural for men to unite in a social state, so it is no less natural for society to be gradually improved and civilized till it attain an high degree of perfection and refinement.

8 Attention to the education of youth a natural consequence of civilization. When men have attained to such knowledge and improvement as to be intitled to a more honourable appellation than that of savages, one part of their improvements generally consists in their becoming more judicious and attentive in directing the education of their youth. They have now acquired ideas of dependence and subordination; they have arts to teach and knowledge to communicate; they have moral principles to instil; and have formed notions of their relation and obligations to superior powers, which they are desirous that their children should also entertain. Their affection to their offspring is now also more tender and constant. We observe at present in that state of society in which we live, that the poor who can scarce earn for themselves and their children the ne-

cessaries of life, are generally less susceptible of parental affection, in all its anxious tenderness, than the rich, or those whom Providence hath placed in easy circumstances; and we may make use of this fact in reasoning concerning the different degrees of the same affection felt by the savage and the member of a civilized society. The savage may be considered as the poor man, who with difficulty procures the necessaries of life even for himself; the other, as the man in affluent circumstances, who is more at leisure to listen to the voice of tender and generous affection.

In this improved state of society, the education of youth is viewed as an object of higher importance. The child is dearer to his parent; and the parent is now more capable of cultivating the understanding and rectifying the dispositions of his child. His knowledge of nature, and his dexterity in the arts of life, give him more authority over a child than what the savage can possess. Obedience is now enforced, and a system of education is adopted; by means of which the parent attempts to form his child for acting a part in social life. Perhaps the legislature interferes; the education of the youth is regarded as highly worthy of public concern; it is considered that the foolish fondness or the unnatural caprice of parents may, in the rising generation, blast the hopes of the state.

In reviewing ancient history, we find that this actually took place in several of the most celebrated governments of antiquity. The Persians, the Cretans, and the Lacedæmonians, were all of them too anxious to form their youth for discharging the duties of citizens to entrust the education of the children solely to the parents. Public establishments were formed among those nations, and a series of institutions enacted, for carrying on and regulating the education of their youths: Not such as our European universities, in which literary knowledge is the sole object of pursuit, the student is maintained solely at his parents expence, and attends only if his parents think proper to send him; but of a very different nature, and on a much more enlarged plan.

The Persians, according to the elegant and accurate account delivered by Xenophon in the beginning of his Cyropædia, divided the whole body of their citizens into four orders; the boys, the youth, the full-grown men, and those who were advanced beyond that period of life during which military service was required. For each of these orders particular halls were appropriated. Each of them was subjected to the inspection of twelve rulers. The adults and the superannuated were required to employ themselves in the performance of particular duties, suitable to their age, their abilities, and their experience; while the boys and the youth were engaged in such a course of education as seemed likely to render them worthy and useful citizens.

The boys were not employed, in their places of instruction, in acquiring literary accomplishments; for to such the Persians were strangers. They went thither to learn justice, temperance, modesty; to shoot the bow, and to lanch the javelin. The virtues and the bodily exercises were what the Persians laboured to teach their children. These were the direct, and not subordinate, purposes of their system of education. The masters used to spend the greatest part of the day in

Education. dispensing justice to their scholars; who carried before them actions for thefts, robberies, frauds, and other such grounds of complaint against one another.—Such were the means by which the Persians endeavoured to instil, even in early youth, a regard for the laws of natural equity, and for the institutions of their country. Till the age of 16 or 17, the boys were busied in acquiring those parts of education. At that period they ceased to be considered as boys, and were raised to the order of the youths. After they entered this order, the same views were still attended to in the carrying on of their education. They were still enured to bodily labour. They were to attend the magistrates, and to be always ready to execute their commands. They were led out frequently to the chase; and on such expeditions they were always headed by the king, as in time of war. Here they were taught to expose themselves fearlessly to danger; to suffer, without repining or complaint, hunger, thirst, and fatigue; and to content themselves with the coarsest, simplest fare, for relieving the necessities of nature. In short, whether at home or out on some hunting expedition, they were constantly employed in acquiring new skill and dexterity in military exercises, new vigour of mind and body, and confirmed habits of temperance, fortitude, abstinence, patience, patriotism, and noble integrity. After spending ten years in this manner, their course of education was completed; they were admitted into the class of the adults, and were esteemed qualified for public offices. It must not escape our notice, that the citizens were not compelled to send their children to pass through this course of education in the public halls; but none except such as passed through this course of education were capable of civil power, or admitted to participate in public offices or public honours.

Such are the outlines of that system of education which Xenophon represents as publicly established among the Persians. Were we able to preserve in a translation all the manly and graceful simplicity of that enchanting author, we would have offered to the perusal of our readers the passage in which he has described it; but conscious of being inadequate to that task, we have presumed only to extract the information which it contains.

11
Remarks
on Xeno-
phon's ac-
count of
Persian
education.

Perhaps, however, this system of education did not subsist precisely as the eloquent disciple of Socrates describes it among that rude and simple people. On other occasions he has commemorated such instances of their barbarity, as would tempt us to think them incapable of so much order and so much wisdom. Perhaps, as the discoverers of the new world have sometimes conferred on the inhabitants of that hemisphere, in the accounts of them with which they entertained their friends in Europe, amazing degrees of moral and political wisdom, of skill and dexterity in the arts, of industry and valour, which those uncivilized children of nature were afterwards found not to possess; so the Athenian philosopher has also ascribed to the Persians prudence and attention in regulating the education of their youth beyond what people in so rude a state can possibly exert.

But if we examine into the principles on which this system of education proceeds, without concerning ourselves whether it once actually prevailed among the

Persians, or is the production of the fine imagination of Xenophon, we will find it peculiarly suitable for a nation just emerging from the rudeness and ignorance of barbarity to a knowledge of social and civil relations, and of the duties connected with such relations. They have sacrificed their independence to obtain the comfort and security of a social state. They now glory in the appellation of citizens, and are desirous to discharge the duties incumbent on a citizen. They must inform their children in the nature of their social relations, and impress them with habits of discharging their social duties; otherwise the society will soon be dissolved, and their posterity will fall back into the same wild miserable state from which they have emerged. But perhaps the circumstances, or abilities, or dispositions of individuals, render them unequal to this weighty task. It becomes therefore naturally an object of public care. The whole social body find it necessary to deliberate on the most proper means for discharging it aright. A plan of education is then formed; the great object of which is, to fit the youth for discharging the duties of citizens. Arts and sciences are hitherto almost wholly unknown: and all that can be communicated to the youth is only a skill in such exercises as are necessary for their procuring subsistence, or defending themselves against human enemies or beasts of prey; and habits of performing those duties, the neglect of which must be fatal to the society or the individual.

Such is the system of education which we have surveyed as established among the Persians; and perhaps we may now be less suspicious than before of Xenophon's veracity. It appears natural for a people who have reached that degree of civilization in which they are described, and have not yet advanced farther, to institute such an establishment. Some such establishment also appears necessary to prevent the society from falling back into their former barbarity. It will prevent their virtue and valour from decaying, though it may perhaps at the same time prevent them from making any very rapid progress in civilization and refinement. Yet the industry, the valour, the integrity, and the patriotism which it inspires, must necessarily produce some favourable change in their circumstances; and that change in their circumstances will be followed by a change in their system of education.

The Cretans, too, the wisdom of whose laws is so much celebrated in the records of antiquity, had a public establishment for the education of their youth. Minos, whom they revered as their great legislator, was also the founder of that establishment. Its tendency was similar to that of the course of education pursued among the Persians,—to form the soldier and the citizen. We cannot present our readers with a very particular or accurate account of it; but such as we have been able to procure from the best authorities we think it our duty to lay before them.

The Cretans were divided into three classes; the boys, the youth, and the adults. Between seven and seventeen years of age, the boy was employed in learning to shoot the bow, and in acquiring the knowledge of his duties as a man and a citizen, by listening to the conversation of the old men in the public halls, and observing their conduct. At the age of seven, he was conducted to the public halls to enter on this

course.

Education.

course of education. He was taught to expose himself boldly to danger and fatigue; to aspire after skill and dexterity in the use of arms and in the gymnastic exercises; to repeat the laws and hymns in honour of the gods. At the age of seventeen he was enrolled among the youth. Here his education was still continued on the same plan. He was to exercise himself among his equals in hunting, wrestling, and the military exercises; and while thus engaged, his spirits were roused and animated by strains of martial music played on such instruments as were then in use among the inhabitants of Crete. One part of the education of the Cretan youth, in which they were particularly desirous to excel, was the Pyrrhic dance; which was the invention of a Cretan, and consisted of various military evolutions performed to the sound of instruments.

Such were the principles and arts in which the Cretan legislature directed the youth to be instructed. This course of education could not be directed or superintended by the parent. It was public, and carried on with a view to fit the boy for discharging the duties of a citizen when he should attain to manhood.

¹³
Remarkson
the Cretan
education

It is easy to see, that such a system of education must have been instituted in the infancy of society, before many arts had been invented, or the distinctions of rank had arisen; at a time when men subsisted in a considerable degree by hunting, and when the intercourse of nations was on such a footing, that war, instead of being occasional, was the great business of life. Such a system of life would then naturally take place even though no sage legislator had arisen to regulate and enforce it.

¹⁴
Among the
Lacedemo-
nians.

Lycurgus, the celebrated lawgiver of Lacedemon, thought it necessary to direct the education of youth in a particular manner, in order to prepare them for paying a strict obedience to his laws. He regarded children as belonging more properly to the state than to their parents, and wished that patriotism should be still more carefully cherished in their breasts than filial affection. The spirit of his system of education was pretty similar to that of those which we have just viewed as subsisting among the Persians and the Cretans.

As soon as a boy was born, he was submitted to the inspection of the elders of that tribe to which his parents belonged. If he was well shaped, strong, and vigorous, they directed him to be brought up, and assigned a certain portion of land for his maintenance. If he was deformed, weak, and sickly, they condemned him to be exposed, as not being likely ever to become an useful citizen. If the boy appeared worthy of being brought up, he was entrusted to the care of his parents till he attained the age of seven years; but his parents were strictly charged not to spoil either his mind or his bodily constitution by foolish tendernefs. Probably, too, the state of their manners was at that time such as not to render the injunction peculiarly necessary.

At the age of seven, however, he was introduced to a public class, consisting of all the boys of the same age. Their education was committed to masters appointed by the state; and what was chiefly inculcated on them in the course of it, was submissive obedience and respect to their superiors; quickness and brevity in

their conversation, and replies to such questions as were put to them; dexterity and address in performing what was commanded them, and firmness and patience in bearing every pain or hardship to which they might be exposed. One of the means used to form them to habits of activity and address, was to permit, nay, to direct them to commit little acts of theft; which, if they performed them so dexterously as to avoid detection, they might afterwards boast of as noble exploits: but if detected in such enterprises, the awkward artless boy was exposed both to punishment and disgrace. To avoid the punishment and disgrace incurred by being detected in an act of theft, the Spartan boy would often suffer with unshrinking fortitude the severest torments. It is related of one of them, that rather than be discovered with a young fox under his cloak, which he had stolen, he suffered the little animal to tear open his bowels. Not content with beholding the children suffer by submitting voluntarily to such hardships, the Spartans also endeavoured to form them to fortitude, by whipping them on their religious festivals, sometimes with such severity that they expired under the lash. The Lacedemonian youth were also taught such bodily exercises, and the use of such warlike weapons, as were necessary to render them expert and skilful soldiers.

They too, as well as the Cretans and Persians, among whom we have seen that somewhat similar modes of education prevailed, were to be citizens and soldiers; not husbandmen, mechanics, artists, merchants, &c. Therefore the mode of education established among them was simple and uniform. Its aim was, to make them acquainted with the nature of their social duties, and to form them to such vigour of body and such firmness of mind as might render them fit for the station in which they were to be placed, and adequate to the part which they were to act. This establishment for education was perfectly consistent with the other parts of that legislature which was instituted by Lycurgus. Youth educated among the Lacedemonians could hardly fail to become worthy members of that singular republic. Let us not however regard the Spartans as *singularly* inhumane in their treatment of youth. Let us reascend, in imagination, to that period in the progress of society from rudeness to refinement, to which they had attained when Lycurgus arose among them. What were then their circumstances, their arts and manners, their moral principles, and military discipline? Not very different from those which the laws of Lycurgus rendered so long stationary among them. He, no doubt, rectified some abuses, and introduced greater order and equality. But man is not to be so easily metamorphosed into a new form: As you cannot, at once, raise an acorn to a venerable oak; so neither will you be able to change the savage, at once, into the citizen. All the art or wisdom of Lycurgus, even though assisted by all the influence of the prophetic Apollo, could never have established his laws among his countrymen, had not their character and circumstances previously disposed them to receive them. But, grant this, and you must, of consequence, allow, that what to us may appear cruel and inhumane, must have affected their feelings in a different manner. The change introduced in the treatment of youth by the establish-

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Education. ment of this system of education was probably recommended by its being more humane than what before prevailed. Corrupted as are our manners, and effeminate our modes of education; yet we would not perhaps act wisely in laying them aside, to adopt in their stead those of ancient Sparta. But the Spartan education was peculiarly well fitted to form citizens for the republic of Lycurgus; it was happily adapted to that state of society in which it was introduced. And, if we should enquire by what means Lycurgus was enabled to fix the arts, the manners, and in short the civilization of his country, for so long a period in a stationary state; we would perhaps find reason to ascribe that effect, to the public establishment which he instituted for the education of youth; to his confining the Spartan citizens to the profession of arms, and assigning all servile offices to the Helots; and to his prohibiting the use of gold and silver. Among these however his establishment for education occupies the chief place. Never was any state adorned with more patriotic citizens than those of Sparta. With them every private affection seemed to be swallowed up by the *amor patriæ*: the love of their country was at least their ruling passion. Pædaretes being rejected when he offered himself a candidate for a seat among the council of three hundred, returned home, rejoicing that there were in Sparta no fewer than three hundred whom his countrymen found reason to regard as better citizens than himself. This was not a seeming joy, assumed to conceal the pain which he suffered from the disappointment; it was heartfelt and sincere. Such were the effects of their system of education.

16 Education among the other nations of antiquity. When we turn our eyes from the Persians, the Cre- tans, and the Spartans, to the other nations of antiquity; we no where behold so regular a system of public education. Among the Athenians and the Romans, the laws did not descend to regulate in so particular a manner the management of the youth. These nations gradually emerged from a state of the rudest barbarity, to that polished, enlightened, and civilized state which rendered them the glory and the wonder of the heathen world: but in no part of their progress from the one state to the other do we find any such establishment subsisting among them. So various, however, are the circumstances which form and diversify the character of nations, that we cannot reasonably conclude, because no such establishments existed among the Athenians and Romans, that therefore their existence was unnatural among those nations who possessed them. But though the education of youth was managed in a different manner among these and most other nations in the ancient world, than by public establishments, which detached children from the care of their parents; yet still it was every where regarded as an object of the highest importance. As the manners of mankind gradually improved to a state of refinement; as the invention of arts, and the discovery of science gradually introduced opulence and luxury; connubial, parental, and filial affection gradually acquired greater strength and tenderness. Of consequence, children experienced more of their parents care; and that care was directed to form them for acting a becoming part in life. According to the circumstances of each nation, the arts which they cultivated, and the form of government

under which they lived; the knowledge which they sought to communicate to their children, and the habits which they endeavoured to impress upon them, were different from those of other nations: And again, according to the different circumstances, tempers, abilities, and dispositions of parents, even the children of each family were brought up in a manner different from that in which those of other families were managed. The Athenians, the Romans, the Carthaginians, conducted each of them the education of their youth in a different manner, because they had each different objects in view. But having considered the most singular establishments for education which prevailed in the ancient world, it seems unnecessary for us to descend to a particular account of the manner which every nation, or fantastic individual, thought proper to pursue in bringing up their youth. It will probably be more useful and entertaining to our readers, if we next present them with a view of some of the most judicious or fanciful plans of education which have been proposed by the writers on that subject.

17 One of the most respectable writers on education among the ancients, is the celebrated Quintilian. He taught rhetoric in Rome during the reign of Domitian and under several of the other emperors. When he retired from the exercise of his employment as a teacher of rhetoric, he spent his leisure in the composition of a treatise, not merely on rhetoric, but on the most proper means for educating a boy so as to render him both an eloquent orator and a good man. In that valuable treatise, he enters into a minute detail of all that appears to him most likely to conduce to those important ends.

As soon as the boy enters the world, he would have the greatest care to be used in selecting those who are to be placed about him. Let his nurse have no impediment of speech. It will be happy for him, if his parents be persons of sense and learning. Let his tutor, at least, possess these qualifications. As soon as he attains the distinct use of his organs of speech, let him be initiated in the first elements of literature. For as he is capable of distinguishing and remembering at a very early age; so his faculties cannot possibly be employed in a more advantageous manner. And even at this early period of life, let maxims of prudence and the first principles of morals be inculcated upon his mind by the books which are put into his hands, and even by the lines which he copies in learning the art of writing. The Greek language was to the Romans in the days of Quintilian, what the Latin and Greek and French are to us at present, an acquisition held indispensably necessary to those who aspired to a liberal education; and Quintilian judges it proper that the boy should begin his application to letters with the Greek language in preference to his mother tongue.

This judicious writer next examines a question which has been often agitated, Whether a domestic or a public education is liable to the fewest inconveniences, and likely to be attended with the greatest advantages? And he is of opinion, that in a domestic education the boy is in danger of being corrupted by injudicious fondness and evil example; is not roused by the spur of emulation; and is deprived of proper opportunities for acquiring a just idea of his own powers, or that

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activity and dexterity which he will afterwards find so necessary when he comes to act a part in life: While in a public education, which was preferred by some of the most renowned nations of antiquity, the morals are not greatly exposed to corruption, emulation is roused, friendships are formed, all the powers of the mind are called forth to act with new vigour, and the youth is prepared for performing his part on the great theatre of the world. Quintilian, therefore, wishes that parents would place their children in public seminaries of education.

When a boy is committed to a master's care, the master's attention must be first directed to discover his dispositions and the extent of his capacity. Of his capacity he will form a favourable judgment, not from his sprightliness, nor even from his quickness of apprehension; but from his modesty, docility, and virtuous dispositions. If the boy possess these last qualifications, the master will rejoice in him, as likely to give him satisfaction and do him honour. According to his temper and dispositions, let the boy be treated with mildness or severity; but never let severity extend to blows. Let the boy be allured and led, by the most artful and insinuating treatment, to do his duty; there will then be no occasion to punish him for neglecting it.

As Quintilian's professed object was, not merely to give general directions for forming the heart and cultivating the understanding, but to form a particular character in life, the scholar and the orator; he finds it necessary to enter into minute details concerning the manner in which the boy is to be instructed in speaking, writing, grammar, and composition; of which it does not appear necessary for us to take particular notice in this place. Music and geometry, he thinks, ought to make a part of the young orator's studies; as being useful to render him accurate in reasoning, and capable of relishing the beauties of the poets. He is also of opinion, that the boy should not be confined to one branch of study, without being allowed to attempt others till he have made himself master of that. Let several parts of literature engage his attention by turns: let him dedicate a considerable portion of his time to them. He may thus acquire habits of industrious application which will remain with him through life.

With the tender attention of a good man, this sensible and elegant writer still accompanies his pupil through the course of his studies; anxiously insists that he be placed under a master distinguished for purity of morals, and for no mean abilities in his profession; directs his memory to be stored with the noblest passages of the poets, orators, and historians; and carefully discusses and refutes those opinions which represent genius as above industry. The remaining part of his work being employed on the principles of rhetoric, without containing any thing on the subject of education in general, it is not necessary that we should here present an analysis of it to our readers. But since Quintilian was so distinguished, not only as a rhetorician, but as an instructor of youth, and displays so much good sense and so solid a judgment, formed on long experience, in whatever he advances on the subject of education; we could not, without extreme negligence, omit taking notice of him under this ar-

ticle, and affording our readers an opportunity of Education, being instructed by listening to his sentiments on this head.

The name of John Milton is so much revered in Britain, that his sentiments on any subject are interesting to Britons. His life was dedicated to study: During a part of it, he was employed in the task of instructing youth; and among his other works we find a treatise on education. He had himself been educated according to that plan which has long been established in the English universities; but with that mode of education he was not satisfied. The object of his directions is chiefly to form the scholar. He considered himself as qualified to exhibit a model of "a better education, in extent and comprehension far more large, and yet of time far shorter, and of attainment far more certain, than any that had yet been in practice." The following is the substance of his treatise.

As the end of learning is to cultivate our understandings, and to rectify our dispositions; therefore the design of our applying to the study of languages cannot be merely that we may commit to memory the words of which they consist, or that we may acquire a knowledge of their analogy and structure; but that we may enrich our minds with the treasures of wisdom which they contain. But in the present modes of education this design does not appear to be kept in view. The learner of Latin is burdened with rules, and themes, and verses, and orations; but no care is taken to make him master of the valuable knowledge which the classics contain. And when he advances a little farther, he is driven into the thorny paths of logic and metaphysics. So, when his studies are completed, and he is considered as having received a liberal education, he is almost as destitute of real knowledge as when he first entered a school.

But to render learning truly beneficial, instead of the school and university education which youth at present receive; let the place of both school and university be supplied by an academy, in which they may acquire all that is taught at either, except law and physics. Let the academy afford accommodation for 150 persons; 20 of whom may be servants and attendants. As many academies as are necessary may be afterwards erected on the model of this one. Let the youth who are introduced into this academy begin their studies with learning the principal rules of grammar from some good elementary book. In their pronunciation of Latin, let them be taught to follow the pronunciation of the Italians; as that of the English is indistinct, and unsuitable to the genius of the language. Next, read to them some entertaining book on education; such as, the three first books of Quintilian in Latin, and Cebes, Plutarch, or some other of the Socratic discourses, in Greek; and be careful to seize every opportunity of inspiring them, by seasonable lectures and explanations, with love for learning, admiration of great and virtuous characters, and a disposition to cheerful obedience. At the same time, but at a different hour of the day, let them be instructed in the rules of arithmetic and the elements of geometry. Between supper and bed-time instruct them in the principles of religion and the sacred history. From the writers on education let your pupils pass to the authors on agriculture, to Cato, Varro, and Columella. Be-

Education. fore half these authors be read, they cannot but be pretty well qualified to read most of the prose authors in the Latin language; and they may now, with great propriety, learn the use of the globes, and make themselves acquainted with the ancient and modern maps. Let them, about the same time, begin the study of the Greek tongue, and proceed in it as in the Latin: they will not fail to overcome, in a short time, all the difficulties of grammar; after which they will have access to all the treasures of natural knowledge to be found in Aristotle and Theophrastus. In the same manner they may make themselves acquainted with Vitruvius, Seneca, Mela, Celsus, Pliny, and Solinus. And having thus passed through the principles of arithmetic, geometry, astronomy, and geography, with a general compact of physics; let them next turn their attention to mathematics, in which they may begin with the practical branch of trigonometry, which will serve as an introduction to fortification, architecture, and navigation. To teach them the knowledge of nature, and instruct them in the arts of life, let them have the assistance and instructions, not merely of masters who are acquainted only with books, but of men whose skill has been obtained by actual practice, even of artists and mechanics. Next, let the poets obtain their attention; and they will now read them with ease and pleasure. From the poets let your pupils proceed to the moralists; and, after acquainting themselves with them, they may be allowed the entertainment of some of the best Greek, Latin, and Italian, dramatic compositions. From these let them proceed to politics: let them here study the law of Moses, the admirable remains of the ancient lawgivers of Greece, the Roman tables, edicts, and pandects, concluding with the institutions of their mother country. Now let them be more particularly instructed in the principles of theology; for by this time they may have acquired the Hebrew language, together with the Chaldee and the Syriac dialect, and may therefore read the scriptures in their original language. When their minds are thus furnished, they will be able to enter into the spirit of the noblest historians and poets. To get by heart, and repeat in a proper manner, passages from the writings of some of these, will have the happiest effects in elevating their genius. Let this stately edifice be crowned with logic and rhetoric. Far different would be the effects of such a course of education, from those produced by any which is at present pursued. We should then see abler writers, more eloquent speakers, and wiser statesmen. Similar to this, probably, was the course taught in the famous schools of Pythagoras, Plato, Isocrates, and Aristotle. This would unite the advantages of an Athenian and a Spartan education: for our pupils should be taught the exercises of wrestling and fencing, and the whole military discipline.

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Remarks.

Such are the ideas of our admired Milton on the subject of education. An enthusiastic admirer of the sciences, arts, and institutions of Greece and Rome; from his religious and political principles, no friend to the universities; it was natural for a man of his learning and ingenuity, in an age of innovation, and influenced by such prejudices, to form such a project as that which we have surveyed. He seems not to have reflected, that it is necessary for children to be long occupied in obtaining a familiar acquaintance with Education. words, before they can gain from books any knowledge of things; overlooking this circumstance, and perceiving plainly that the mode of education which then prevailed confined the attention of youth almost wholly to words, he could not but regard the scheme which he proposed as likely to produce very happy effects. His observation, that the appearances of external nature are among the first objects which attract the attention of youth, which he communicates by directing his pupils to peruse the writers on agriculture and natural history as near the beginning of their studies as possible; if not altogether just, yet must be allowed to be nearly so. Perhaps human actions and passions, and the series of events which happen around us, are, by the time at which we begin our application to learning, the objects which most frequently and strongly engage our attention: But the appearances of external nature are at least the next object of our regard.

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Mr Locke, to whose abilities and noble desire to be useful to the world his country is so much indebted, has written, among other things, on the education of youth. He was capable of thinking for himself; but more desirous of rendering himself useful, than of being admired for singularity. He is, therefore, an author to whom we ought to listen, at least, with respectful attention. If Quintilian and Milton had been employed as teachers of youth, Mr Locke had been conversant with the world, had inquired into the principles of human nature, and had no doubt endeavoured to examine without prejudice the effects of those modes of education of which he disapproves. When we consider, that, to render himself useful to the rising generation, he could descend from the heights of science to translate the fables of Æsop, and to perform other humble tasks in literature, which a philosopher of less benevolence and virtue would have disdained; we cannot but look with veneration and gratitude on so exalted a character. In his *Treatise on Education*, the two great objects which Mr Locke keeps in view are, 1st, To preserve and strengthen the bodily constitution; 2dly, To inform the understanding with useful knowledge, and to cherish good dispositions in the heart.

In his directions on the first of these heads, he seems extremely anxious to prevent parents and others in whose hands children are placed, from injuring them by ill-directed tenderness. Plain fare, simple and light cloathing, abstinence from physic and from strong liquors, he earnestly recommends as the most judicious means for preserving and confirming the health of the child. In all his gratifications let the strictest moderation be observed. If you permit him to indulge pretty freely in sleep, at least cause him to get up at an early hour in the morning. In one thing, however, few parents will be willing to comply with Mr Locke's advice. He not only directs that the child's feet be frequently bathed in cold water; but even expresses a wish, that his shoes were always kept in such a condition as to admit water freely. This he thinks likely to fortify the constitution of the body in such a manner, as to render him less liable, in the course of life, to such diseases as arise from any unusual exposure to wetness or cold, than others whose feet

Education. feet have been more carefully kept dry. Though he had prosecuted his studies with a design to enter into the profession of physic, yet so unfavourable an opinion did he entertain of the effects produced by medical preparations on the human constitution, that he earnestly insists on the parent to beware of administering any of them to his child. From the desire which Mr Locke discovers to have children exposed to hardships, and restrained from indulgence, in order to confirm the health and invigorate the constitution, we may conjecture him to have been an admirer of that severe mode of education which usually prevails in the earlier periods of the existence of society. He seems to have thought, that if a boy be brought up like a Huron or a Spartan, he must necessarily become robust and healthy; without reflecting, that of those children who are subjected to such a course of education, too great a proportion are unable to survive it: such is the natural delicacy of the human frame.

22
Cultivation
of the powers
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When he turns his attention to the cultivating of the understanding, and the forming of the dispositions, Mr Locke still deservedly claims the regard of the parent and the preceptor. With a virtuous indignation he reprobates that negligence and folly by which we generally corrupt the heart and spoil the temper of children, even in the period of infancy; so as to render them incorrigible when they advance farther in life. Their appetites are pampered, all their desires are gratified; and if we are at any time disposed to refuse what they ask, they have an all-powerful engine to compel our compliance with their wishes. They assail us with tears; and we then yield to their requests, however hurtful to themselves or inconvenient to us. We often studiously instruct them in vicious tricks, and call forth their evil passions. At so early an age, their rage or cunning can scarcely injure us; and we reflect not that habits of peevishness and deceit must be peculiarly hurtful to themselves.

But though all the foolish desires of children ought not to be gratified, and though we should carefully avoid leading them into any bad habit; yet it is not necessary nor prudent to treat them with harshness or severity. Let them be formed to obedience from their earliest years: let them be accustomed to submit implicitly to the direction of those on whom they depend. But beware of souring their temper and depressing their spirits by harshness: and on the other hand, remember, that it is no less improper to give the boy a habit of neglecting his duty except when he is allured to it by the hopes of reward. As he advances towards manhood, and attains the use of reason; you may admit him to greater familiarity, and allow him to follow his own inclinations more than at an earlier period: and if, instead of indulging all his freaks in childhood, you have carefully accustomed him to obedience and submission, without enforcing these by improper means, he will now be able to regulate his conduct with some degree of prudence.

But while caution is to be used in bestowing rewards and inflicting punishments; still rewards and punishments are indispensably necessary in the management of the child. Inspire your boy with a sense of shame, and with a generous thirst for praise. Carefs and honour him when he does well; treat him with

neglect when he acts amiss. This conduct will produce much better effects than if you were at one time to chide and beat him; at another, to reward him with a profusion of sweetmeats and playthings.

Think not that children are to be taught propriety of conduct by loading their memory with rules, directing them how to act on every particular occasion. Burden them not with rules, but impress them with habits.

Be not desirous of forming them at too early an age, to all that politeness and propriety of manners which you wish to distinguish them when they become men. Let them be taught an easy, graceful carriage of body: but give yourself no concern, though they now and then blunder against the punctilios of good-breeding; time will correct their awkwardness.

With regard to that important question, whether children ought to be sent to a public school, or are likely to be better trained up in a domestic education? so impossible is it for one master to extend his attention to a number of boys, and so likely is the contagion of vice to be caught among the crowd of a public school, that a private seems more favourable than a public education to virtue, and scarce less favourable to learning.

When you resolve to give your son a domestic education, be careful to regulate that domestic education in a judicious manner. Keep him at a distance from evil example: choose the most favourable seasons for communicating instruction: strictly enforce obedience; but never by blows, except in case of obstinacy which you find otherwise incurable. If his engagements in life prevent the parent from superintending and directing his son's education personally, let him commit him to the care of a virtuous and judicious tutor. Let the tutor be rather a man of experience in the world than of profound learning; for it is more necessary that the pupil be formed for conducting himself with prudence in the world, and be fortified against those temptations to which he will be exposed when he enters upon active life, than that his head be stuffed with Latin and logic.

Here Mr Locke, notwithstanding that his own mind was stored with the treasures of Grecian and Roman literature, takes occasion to declare himself pretty freely against that application to ancient learning, which was then indispensably required in the education of youth. He considers languages and philosophy as rather having a tendency to render the youth unfit for acting a prudent and becoming part in life, than forming for it: and he therefore insists that these should be but in a subordinate degree the objects of his attention.

Let the tutor encourage the child under his care to a certain degree of familiarity; let the pupil be accustomed to give his opinion on matters relative to himself: let him be taught justice, by finding injustice to others prejudicial to himself; let him be taught liberality, by finding it advantageous; let him be rendered superior to teasing his parents or tutor with complaints, by finding his complaints unfavourably received. That you may teach him to restrain every foolish or irregular desire, be sure never to indulge his wishes, save when you find the indulgence proper for him, and convenient for yourself. Curiosity, how-

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Education. ever, is a principle which ought to be industriously roused in the breast of the child, and cherished there by meeting always the readiest gratification. However you may oppose the boy's inclinations in other things, yet refuse him not a proper portion of recreation: let him indulge in play, while he continues to play with keenness and activity; but suffer him not to loiter about in listless indolence. To restrain your child from fool-hardy courage, point out to him the dangers to which it exposes him: to raise him above timorous cowardice, and inspire him with manly fortitude; accustom him from the earliest period of life to an acquaintance with such things as he is most likely to be afraid of: subject him now and then to pain, and expose him to danger; but let such trials be judiciously conducted.

Idleness or curiosity sometimes leads children to cruelty in their treatment of such animals as are placed within their power. Dogs, cats, birds, and butterflies, often suffer from their inhumanity. But when they seem inclined to such cruelty, let them be carefully watched, and let every means be used to awake their hearts to generous sensibility. Allow them to keep tame birds, dogs, &c. only on condition of their using them with tenderness. Perhaps this unhappy disposition to cruelty is occasioned, or at least fostered, by people's laughing when they behold the impotent efforts of children to do mischief; and often going so far as even to encourage them in maltreating those creatures which are within their reach. We entertain them, too, with stories of fighting and battles; and represent characters distinguished for atrocious acts of inhumanity as great and illustrious. But let such practice be carefully restrained from, if you wish to inspire your child with generous and humane sentiments. Teach him gentleness and tenderness, not only to brute animals, but also to servants and companions.

Curiosity is to be roused and cherished in the breast of the child: but by what means? Answer his inquiries readily: though his questions be put in awkward language, let not that hinder you from attending to the objects of them. Curiosity is natural to the human mind; and if you repress not the curiosity of the child, he will often be moved by its impulse to the pursuit of knowledge. Let him find his eagerness in the pursuit of knowledge, a source of applause and esteem. Avoid the folly of those who sport with the credulity of children, by answering their questions in a ludicrous or deceitful manner.

You must, however, not only listen with obliging attention to his questions, and strive to gratify his curiosity; but even whenever he attempts to reason on such subjects as are offered to his observation, be careful to encourage him: praise him if he reasons with any degree of plausibility; even if he blunders, beware of ridiculing or laughing at him. With regard to the boy's play-things: while you indulge him freely in innocent diversions, give him such play-things as may be necessary in the amusements in which he engages, provided they be such as he cannot make himself; but it will be still better for him to exercise his dexterity and ingenuity in making them himself.

After throwing out these things concerning the general principles on which education should be carried on, Mr Locke next proceeds to those particular parts

of knowledge in which he thinks every young gentleman ought to be instructed. In virtue, wisdom, breeding, and learning, he comprehends all that is necessary to enable his pupil to act a respectable part in life.

In forming the boy to virtue, the first thing to be done, is to inform him of the relation subsisting between human creatures and a supreme independent Being, their creator, preserver, and governor; and to teach him, that obedience and worship are due to that Being. But when you inform the child of the existence of an invisible Being, beware of impressing his mind with any notions concerning spirits or goblins, which may render him incapable of bearing darkness or solitude. In infancy our minds are, by the indiscretion of those about us, generally impressed with such prejudices concerning a thousand frightful forms, ever ready to assail or haunt us under the shade of night, that we become incapable of manly fortitude during the course of life: the soldier who will boldly face death in the field of battle, shall perhaps tremble and take to flight at the rustling of a few leaves, or the grunting of a hog in the dark. But were the imaginations of children not crazed with wild stories concerning spirits and hobgoblins, darkness would be no more alarming to them than light. After informing the child of the existence of a Deity, and teaching him to pray to him; next labour to impress his mind with a veneration for truth, and habituate him to a strict adherence to it on every occasion. Endeavour also to render him gentle and good-natured.

The best means you can use to teach him wisdom or prudence in conducting himself in the ordinary business and intercourse of life, is to teach him to despise the mean shifts of cunning. The rest must be learned by actual experience in life.

The decencies of life, comprehended under the word Good Breeding, form no inconsiderable part of a good education. In teaching these, two things are to be attended to: Inspire the youth with a disposition to please and oblige all with whom he is conversant; next, teach him how to express that disposition in a becoming manner. Let boisterous roughness, haughty contempt of others, censoriousness, impertinent raillery, and a spirit of contradiction, be banished from his temper and behaviour. At the same time, beware of leading him to regard the mere forms of intercourse as a matter of the highest importance. Remember that genuine good-breeding is only an easy and graceful way of expressing good sense and benevolence in his conversation and deportment.

Mr Locke, when he comes to give his opinion concerning those parts of learning which are proper to be taught a young gentleman, and the manner in which they ought to be communicated, advises to initiate the child in the art of reading, without letting him know that he is engaged about a matter of any importance, or learning an accomplishment which you are solicitous that he should acquire. Present it to him in the form of an amusement, or teach him to consider it as an high honour to be permitted to learn his alphabet; otherwise he will turn from it with disgust. When by insinuating arts you have allured him to apply to reading, put into his hands such books as are plain, entertaining, and instructive. Insist not on his reading over the bible: instead of gaining any advantage from an indiscriminate perusal

Education. perusal of it at this period of life, he is likely to acquire the most confused notions of religion, and an indifference for the sacred volume during the rest of life; yet it may be highly proper to cause him to peruse some of its beautiful historical passages, and to familiarize him with its elegant and simple moral precepts. After learning to read his mother-tongue, the boy's attention ought to be next directed to the art of writing. The easiest way to teach him that art, is to get a plate engraved, after the model of any hand which you think most proper for his imitation. With this plate get a number of copies cast with red ink; the letters of these the learner may trace with his pen filled with black ink: and he will thus in a short time, and without much trouble to you or himself, acquire a decent hand. As drawing is useful on many occasions in life; if the boy be not naturally incapable of acquiring it, he may with great propriety dedicate some part of his time and attention to that art.

When the scholar has attained a tolerable degree of skill in writing, and in reading and speaking his native language, he must next begin an acquaintance with other languages. Among these, the first object of his study will naturally be the Latin. Yet let none waste their time in attempting to acquire a knowledge of Latin, but such as are designed for some of the learned professions, or for the life of a gentleman without a profession. To these last it may be useful; to others it is wholly unserviceable. But in learning the Latin tongue, a much happier method than burdening and perplexing him with rules of grammar, would be to make him speak it with a tutor who were sufficiently master of it for that purpose. Thus might he spend that time which is usually occupied in acquiring this language, in learning some other necessary branches of education. But if you cannot conveniently have the boy taught the language by the way of conversation, let the introductory books be accompanied with an English version, which he may have easy recourse to for the explanation of the Latin. Never perplex him with grammatical difficulties. Reflect that, at his age, it is impossible to enter into the spirit of those things. Render every thing as easy and pleasing as possible; for the attention will not fail to wander, even though you labour not to render the task disagreeable. Skill in grammar may be useful; but it is to those whose lives are to be dedicated to the study of the dead languages: that knowledge which the gentleman and the man of the world may have occasion to derive from the treasures contained in the ancient languages, may be acquired without a painful study of prosody or syntax. As the learning of any language is merely learning words; if possible, let it be accompanied with the acquisition of some real knowledge of things; such as the nature of plants, animals, &c. their growth and propagation. But if you cannot or will not give your boy a private education, and are still resolved to send him to school, to be whipped through the usual course of Greek and Latin; at least act with so much good sense and humanity, as to insist that he be not burdened and tormented with the composition of Latin themes and verses. Neither let his memory be oppressed with whole pages and chapters from the classics. Such ridiculous exercises have no tendency, whatever prejudice

Education. may urge to the contrary, to improve him either in the knowledge of languages or of nature.

Mr Locke seems to wish that the French language, which in his days had attained to higher refinement and a more regular analogy than any of the other modern languages of Europe;—he seems to wish that the French were learned along with the Latin: and he wishes the study of these languages to be accompanied with the study of arithmetic, geography, history, and chronology. Let these branches of knowledge be communicated to the learner in one of the two languages; and he will thus acquire the language with greater facility. He next points out the advantages of the branches of knowledge which he recommends as proper to be learned together with the languages; but on that head he says nothing singular. One method which he recommends for facilitating the study of language is, to put into the youth's hands, as soon as he has acquired a tolerable knowledge of chronology, some of the most entertaining Latin historians: the interesting nature of the events which they relate will not fail to command his attention, in spite of the difficulty which he must find in making out their meaning. The Bible and Tully's Offices will be his best guides in the study of ethics. The law of nature and nations, as well as the civil and political institutions of his country, will form to him an important object, which he ought to study with the most careful attention. Rhetoric and logic, though generally regarded as objects of great importance in a liberal education, can neither of them contribute much, with all their rules and terms, to render him an acute reasoner or an eloquent speaker; and it is therefore unnecessary for him to honour them with very particular attention. Tully and Chillingworth will be more beneficial in teaching him to reason and to persuade, than all the treatises on rhetoric and logic which he can possibly peruse, or all the lectures on those arts which he can gain opportunities to hear. In every art and every science, practice and experience are infinitely better than rules. Natural philosophy, as contributing to inspire the breast with warmer sentiments of devotion, and serving also to many useful purposes in life, ought to make a part in the young gentleman's studies. But the humble experimental writers on that subject are to be put into his hands in preference to the lofty builders of systems. As for Greek, our pupil is not to be a professed scholar, but a gentleman and a man of the world; and therefore it does not appear necessary that Greek should make a part in the system of his education. But in none of these studies will the pupil ever attain any proficiency, unless he be accustomed to method and regularity in the prosecution of them. In languages, let him gradually ascend from what is simplest to what is most difficult: in history, let him follow the order of time; in philosophy, that of nature.

Dancing, as contributing to ease and gracefulness of carriage, ought to make a part in our young gentleman's education. Fencing and riding being fashionable, cannot well be denied him. As he is likely, in the course of life, to have some leisure hours on his hands, and to be sometimes disposed to active recreation, let him learn some mechanical trade, with the

Education. exercise of which he may agreeably fill up some of those hours. If he is to possess any property, let him not be unskilled in the management of accounts. Travel, instead of being useful, appears more likely to be hurtful to the understanding and morals of the traveller, unless deferred to a later period than that at which young men are usually sent out to complete their education by traversing through foreign countries.

Here Mr Locke concludes his work with observing, that he does not offer it to the world as a full or comprehensive treatise on the subject of education; but merely as the outlines of what occurred to him as most proper to be observed in breeding up a young gentleman not intended for any learned profession or mechanical employment, but for acting a respectable part in life at the head of a competent hereditary fortune.

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Remarks.

In considering the sentiments of this respectable philosopher on the subject of education, we perceive, that as he was, on the one hand, superior to those prejudices which render us incapable of distinguishing the defects or absurdities of any custom or institution which has long prevailed; so, on the other hand, he was free from that silly vanity which disposes those who are subject to its influence to affect novelty and singularity of sentiment on every subject which they consider. Though a member of one of the universities, he hesitates not to declare himself against a very laborious attention to classical learning; and his reasoning is, through the whole of his treatise, rather plain and solid than subtle or refined.

Yet, however we respect the soundness of his understanding or the benevolence of his intentions, we cannot avoid observing, that his opinions are not always such as experience justifies. He had no doubt taken notice of some instances in which the too great anxiety of parents about the preservation of their children's health was the very means of rendering their constitution feeble and tender through the course of life; and from that circumstance might be led to propose those expedients which he mentions for preserving the health and strengthening the constitution of children. But a little more observation or inquiry would have easily convinced him, that some of his expedients, instead of strengthening the child's constitution, would in all probability shorten his days.

He had perhaps seen some of the heroes of classical literature, who were familiar with Demosthenes and Cicero, and had Homer and Virgil at their fingers ends,—he had seen some of those gentlemen so overloaded with their cargo of Greek and Latin as to be unfit for the ordinary business and intercourse of life; and such instances might tempt him to forget the advantages which he himself, and a long series of philosophers, patriots, and statesmen, with whose names the annals of our country are adorned, had derived from a regular classical education. But as we are afterwards to deliver our own sentiments on this subject, we will not here extend our observations on Mr Locke to a greater length.

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Roussseau.

An author more distinguished than Mr Locke, for tenderness of sentiment, singularity, eloquence, and whim, has presented the public with a work on the subject of education, in which he, with unexampled boldness, inveighs against all the established modes, as well as reprobates whatever had been advanced by former writers on the subject; and, at the same time, deli-

neates a plan of education which he would persuade us Education. is infinitely superior to those which he explodes. This writer is the amiable and pathetic Rousseau: And tho' he be often vain, paradoxical, and whimsical; yet the charm of genius and sentiment which adorns his writings will at least engage our attention while he unfolds his opinions.

He sets out with observing, that our business in the bringing up of children should be, to second and to call forth nature; and that, instead of this, we almost always oppose her intentions and operations. As soon as the child sees the light, he is wrapped in swathing bands. His limbs are thus restrained from that free motion which is necessary to their growth and vigour; and even the internal parts of his frame are rendered incapable of their proper functions. Mothers are too proud or indolent, or too fond of gaiety and dissipation, to submit to the task of nursing their own children. The poor infants are committed to some hireling nurse, who not being attached to them by natural affection, treats them with negligence or inhumanity. But is that mother capable of any delicacy of sentiment, who can permit another to suckle her child, and to share with her, or perhaps wholly supplant her, in the filial affection of that child?

Again, when parents undertake the care of their infant children, they often injure them by mistaken tenderness. They pamper them with delicate meats, cover them with warm clothes, and anxiously keep them at a distance from all that has the appearance of danger: not attending to the economy of nature, who subjects us in infancy to a long train of epidemical distempers, and exposes us during the same period to innumerable dangers; the design of which doubtless is, to teach us a prudent concern for our own safety, and to strengthen and confirm our constitutions.

A child no sooner enters into life, than it begins to cry; and during a great part of infancy continues frequently to shed tears. We either attempt to soothe it into good nature, or seek to silence it by harsher means; and it is thus we infuse into its infant mind those evil passions which we afterwards presume to impute to nature.

As the mother generally disdains to nurse her own child, so the father is seldom at leisure to take any share in the management of his education: he is put into the hands of a tutor. But that tutor whose time and attention can be purchased for money is unworthy of the charge. Either be yourself your son's preceptor, or gain a friend whose friendship to you shall be his sole motive to undertake the task.

After a few preliminary observations to the above purport, our author introduces his Emilius; in whose education he delineates that plan which he prefers. The preceptor whom he would assign Emilius must be young; and must dedicate his attention to Emilius alone, from the time when his pupil enters the world till he attain the full age of manhood. Emilius, to receive the full benefit of his preceptor's system of education, and to afford full scope to it, must possess a genius of the middle class; no prodigy of parts, nor singularly dull; he must have been born to affluent circumstances and an elevated rank in life. His preceptor is invested with the rights, and takes upon him the obligations, of both father and mother. Emilius is, when put into

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Imprudent
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Management of E-
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Education. into the hands of his preceptor, a well-shaped, vigorous, and healthy child. The first care of the preceptor is to provide him with a nurse, who, as he is new born, must be newly delivered: it is of still higher importance that she be clean, healthy, virtuous, and of mild dispositions. While suckling her charge, she shall feed plentifully, chiefly on a vegetable diet. The child must be frequently bathed, in cold water if possible; if you begin with warm, however, use it by degrees colder and colder, till at length he is able to bear it entirely cold. He is not to be wrapped in swaddling-clothes or rollers, or bound with stay-bands; but put in good warm blankets and in a roomy cradle: Let him stretch and move his limbs at freedom, and crawl about on hands and knees at his pleasure. The greatest care must now be taken to prevent the child from contracting any habits whatever: Suffer him not to use one arm more than another, or to eat or sleep at stated hours. Prepare him for the enjoyment of liberty, by preserving to him the exercise of his natural abilities, unfettered by any artificial habits.

As soon as the child begins to distinguish objects, let his education begin. Some objects are naturally agreeable, others frightful. Accustom him to look upon any object that may come in his way without being affrighted. Children are at first ignorant of local relations, and learn to distinguish them only by experience; and while Emilius is yet an infant, incapable of speaking or walking, he may be assisted in acquiring the knowledge of these.

In his feeble helpless condition, the child must feel many wants and much uneasiness; tears are the language which nature has given him to make known his distresses and wants. When the child cries, it would be much more prudent and humane to examine what he suffers or stands in need of, than, as is usually done, to rock or sing him asleep; or, when these means succeed not, to threaten or use him brutally.

In managing children, as nature has endowed them with no superfluous powers, we ought not to confine them from the free use of those which they are able to exert. It is our duty to supply their deficiency both of mental and bodily powers; but while we are ready to administer on every occasion to their real wants, we must beware of gratifying their caprice or unreasonable humours. In order to distinguish between their natural and fantastic wants, we must study the language and signs by which they express their wishes and emotions. Though crying be the means which nature has given infants to enable them to procure relief or assistance, yet when they cry they are not always in need of either. They often cry from obstinacy or habits of peevishness. But if, instead of attempting to soothe them by diverting their attention to other objects, we would on such occasions entirely neglect them, they would soon cease to indulge in such fits of crying.

When children begin to speak, we are usually anxious about their language and articulation, and are every moment correcting their blunders. But instead of hoping to teach them purity or correctness of speech by such means as these, let us be careful to speak easily and correctly before them, and allow them to express themselves in the best manner they can. By such means we will be much more likely to obtain our wishes

in this matter. When they speak, let us not listen with such solicitude as to relieve them from the necessity of using an open distinct articulation. **Education.**

When the child attains the power of expressing himself in artificial language, he may then be considered as having reached the second period of infancy. He needs not now to make known his wants by tears, and should therefore be discouraged from the use of them. Let his tears be entirely neglected. He now begins to run about, and you are anxious to prevent him from hurting himself; but your anxiety can only render him peevish or timid. Remove him from any very alarming danger, and then suffer him to run about at his pleasure. He will now and then bleed, and hurt himself; but he will become bold, lively, and cheerful.

In regulating the conduct of your child, let him know that he is dependant; but require not of him an implicit submission to your will. Let his unreasonable desires be opposed only by his natural inability to gratify them, or by the inconveniences attending the gratification. When he asks what is necessary or reasonable, let him instantly obtain it; when he asks what is unreasonable or improper, lend a deaf ear to all his intreaties and demands. Beware of teaching him to establish his authority over you by means of the forms of politeness. A child will scarce take the trouble to address you with *If you please*, unless he has been made to regard these as a set of magic syllables, by the use of which he may subject every person to his will. His *If you please* then means *I please; pray*, with him, stands for *do*. Though you put in his mouth the words of humility, his tone and air are those of authority that will be obeyed. ²⁷ **Subjection to authority.**

Sacrifice not the present happiness of your child for the sake of any distant advantage.

Be not too anxious to guard him against natural evil. The liberty which he enjoys while he is now and then permitted to expose himself to blows, or cold, or wetness, is more than a sufficient compensation for all that he thus suffers.

Seek not to impress him with ideas of *duty* or *obligation*. Till children reach the years of discretion, they are incapable of any notions of the distinctions of morality. Avoid therefore even the use of the terms by which these are expressed in their hearing. While they continue to be affected only by sensible objects, seek not to extend their ideas beyond the sphere of sensation. Try all the powers of language, use the plainest and most familiar methods you can contrive; you shall still be unable to give the boy at this age any just ideas of the distinction between right and wrong. He may readily conceive, that for one set of actions you will punish him, and that by another he will obtain your approbation; but farther than this his ideas of *right* and *wrong*, of *virtue* and *vice*, cannot yet be carried. ²⁸ **Ideas of moral obligation.**

The powers of the human mind are gradually unfolded. At first, the infant is capable only of perception; by and by, his instincts and passions begin to exert their force; at length, as he advances towards manhood, reason begins to act, and he becomes able to feel the beauty of virtue and the deformity of vice.

But though you seek not to regulate his conduct by

Education. by notions of *duty*, yet let him feel the yoke of necessity. Let him know, that as he is weaker than you, he must not, therefore, expect that you should be subject to his will; and that, as he has neither skill nor strength to control the laws of nature, and make every object around him bend to his pleasure, he cannot hope to obtain the gratification of all his wishes. Thus you teach him virtue before he knows what virtue is; and call forth his reason without misleading or perverting it. Let him feel his impotence; but forbid him not to think, that if he had power there would be no reason why he might not at pleasure even turn the world upside down.

Hitherto you have given your pupil no verbal instructions, nor must you yet attempt to instruct him by any other means than experience; let all his knowledge be literally of his own acquisition.

Let not the parent who has observed the conduct of children brought up in the usual way be afraid that, if his child should be treated like our pupil, he would become stupid and vicious. Nature sends not human beings into the world with a predisposition to vice: we sow the seeds of it in the infant heart; and by our absurd modes of treatment, we also enfeeble and pervert the powers of the understanding.

But from the hour of his birth till he attain the age of twelve, the education of Emilius shall be purely negative. Could we but bring him up healthy and robust, and entirely ignorant, till that period, the eyes of his understanding would then be open to every lesson: free from the influence of habit and prejudice, his passions would not then oppose us; and we might render him the wisest and most virtuous of men. If we can but lose time, if we can but advance without receiving any impressions whatever, our gains are unspeakable. Nature gives the powers of every mind some particular direction: but that particular bias, impressed by the hand of nature, cannot be distinguished before the period we have mentioned; and if you counteract nature, instead of seconding her views, the consequences cannot but be highly unfavourable both to the heart and the understanding of your pupil.

Perhaps, in the midst of society, it may be difficult to bring up our pupil without giving him some idea of the relations between man and man, and of the morality of human actions. Let that, however, be deferred as long as possible.

Were Emilius to witness a scene of anger, and to ask the cause of the appearances which he beheld, he should be told that the persons were affected with a fit of sudden illness. We might thus perhaps prevent the unhappy effects of such an example.

The first moral notions which should be communicated to the child are those of property. To communicate the ideas of property to our pupil, we will direct him to take possession of something; for instance, of a piece of ground belonging to some other person, and in a state of cultivation. Let him cultivate this spot of ground anew, sow it with seeds, and look eagerly forward to the time of harvest in the hopes of reaping the fruit of his labours. In the mean time, let the proprietor of the ground take notice of what is done, destroy your pupil's rising crop, and complain of the injustice done him. While the boy laments his loss and the disappointment of his hopes, in all the

bitterness of grief, let the proprietor of the ground still insist on the injury done him, and complain of what he suffers by the purpose for which he himself had cultivated and sown the ground being frustrated. Our pupil, now sensible of the reasonableness of the other's claims, will desist from his lamentations, and only beg to have some other spot assigned him which he may cultivate at his pleasure without offending any person. This he will justly consider as his own property, to the productions of which raised by his own labour he has an exclusive right, and in the occupying of which none ought to molest him. In some such manner as this may the nature of property, the idea of which easily refers in this instance to the first occupier, and afterwards the exchange of property, be explained to him.

Another instance of the manner in which the pupil is now to be managed may not be improper in this place. He is possibly so rude and boisterous as to spoil or break whatever is within his reach. Be not angry with him, however, if he break the utensils which he has constant need of; be in no haste to supply him with others in their room; let other things be removed out of his way: if he break the windows of his apartment, let him be exposed night and day to the cold; complain not of the inconvenience yourself, but order matters so that he may feel it. After some time, let them be mended up; and if he break them again, change your method. Tell him calmly, "These windows are mine; I took care to have them put there; and I will prevent their being again broken, by confining you in a dark room." Let all his endeavours to avoid this prove ineffectual. Let him be actually confined, and be liberated only on proposing and agreeing to the condition of breaking no more windows. When he proposes this condition, be ready to listen to him; observe that it is well thought on, and that it is a pity he did not think of it sooner. Consider this engagement between you as sacred; treat him as before, and you cannot fail to attain the end in view.

The moral world now opens to us: But no sooner are we able to distinguish between right and wrong, than we become desirous to conceal those instances in which we act wrong. Lying is therefore a vice of which your pupil is now apt to be guilty: you cannot always prevent, but you can punish; but let the punishments which you inflict appear to the child only the natural consequences of his conduct. If he is in any instance convicted of a lie, let his assertions no longer gain credit. By this means, sooner than by precepts, or any other species of punishment, will you be able to reclaim him from the habit of lying.

The methods generally taken to render children virtuous are preposterous and foolish. To render them generous and charitable, we give them money, and bid them bestow it in alms, while we ourselves give nothing; but the parent or master, and not the child, should bestow the alms. Example might produce the wished-for effect. Besides, children are strangers to the value of money. A gingerbread cake is more to them than an hundred guineas. Though you teach them to give away money, till you persuade them to part readily with those things which they value most, you do not inspire them with generosity. Would you make them liberal

Education. by showing them that the most liberal is always best provided for? this is to teach covetousness, not liberality. Example is the only means by which you can, at this period, hope to teach your pupil any of the virtues.

The only lesson of morality that can with any propriety be inculcated on children, is to injure no person. Even the positive precept of doing good, must be considered as subordinate to this negative one of doing no harm. The most virtuous and the most exalted of characters, is the man who does the least harm to his fellow-creatures.

In a public education, it will be necessary to attempt the communication of moral instruction at an earlier period than in a private one. In a private education, it will always be best to allow the moral powers of children to ripen as much as possible before you endeavour to inform and direct them by precepts.

There is an inequality among geniuses; and fond mothers and fathers may be disposed to plead for exceptions in favour of such of their children as they view with a partial eye. "This boy's mind is more capacious, his powers are riper, than those of others." But however great the seeming disparity of geniuses may be, it is at bottom but inconsiderable. Let the age of children be therefore regarded as a common measure by which their treatment is to be regulated.

However quick and tenacious the memories of children may seem, they can derive little advantage from the exertions of memory till such time as judgment begins to act. All the knowledge that they acquire in the course of the usual system of education, is merely the knowledge of words. The languages, geography, chronology, in short all that they are taught, and called to display so ostentatiously at this period of life, serve no other purpose than to fill their minds with words.

History is esteemed a proper thing to be put into the hands of children. But except you wish to confine their attention to the external and physical actions, it is almost nothing they can acquire by the perusal of it. And if divested of the moral distinctions of actions, of the workings of the passions, and the complication of interests, what is there to render history entertaining? We may indeed easily teach them to repeat the words *kings, emperors, wars, conquests, revolutions, laws*; but of the things which you use these words to denote, you will find they are hitherto incapable of forming any clear ideas.

But the mere knowledge of words is not science; make your pupil acquainted with things, and he will not fail to acquire their names. Emilius must never be set to get any composition by heart, not even fables: be careful to place before him those scenes and objects, the images of which it may be useful for him to have impressed on his memory; but by no other means seek to assist him to improve that faculty.

Emilius shall not even learn to read till he attain the age of twelve: for, before that period, it can be of no benefit to him; and the labour would only make him unhappy during that period of life which is naturally the golden part of our days. But when he has attained the proper age, matters shall be so ordered, that he shall find his ignorance of letters an inconvenience. A card shall be sent him, which being unable

to read, he will apply to some of those about him. **Education.** They may be unwilling to oblige him, or otherwise engaged. If, at length, it is read to him, that may be when it is now too late to take advantage of some agreeable invitation which it contained. This may be two or three times repeated. At length he becomes eager to learn to read; and accomplishes that almost without assistance.

The principle on which we proceed, is to leave the pupil almost wholly under his own direction, seemingly at least; to lead him to acquire new accomplishments, solely from the desire of increasing his powers, and extending his influence; and humbly to follow nature, not to force her.

As we are desirous of cultivating his understanding, the means which we employ for that purpose is, to cultivate those abilities on which it depends; he is always active and in motion. Let us first make him a man in point of health and vigour, and he will soon become a man in understanding.

By our constant attention to the welfare of children, we render it unnecessary for them to attend to it themselves. What occasion has your son or pupil to observe whether the aspect of the sky threaten rain, when he knows that you will take care to have him sheltered from a shower? or to regulate the length of his excursions, when he is sure that you will not suffer him to lose his dinner?

While matters are so ordered that Emilius thinks himself subject only to his own will, though all his motions are regulated according to your pleasure; instead of becoming fantastic and capricious, he insensibly acquires the habit of keeping utility in view in all his actions.

The first objects which engage the attention of children are the appearances of the material world around them: our first study is a kind of experimental philosophy; our instruments and instructors are our hands, our feet, and our eyes. By exercising these bodily organs, the boy will acquire more real knowledge even in the period of childhood, than if we should dedicate nine-tenths of his time to books, from the age of six to sixty. All who have examined, with any sagacity, the characters, circumstances, and manners of the ancients, have agreed in attributing to their gymnastic exercises that superior strength of body and mind which renders them objects of admiration to the moderns.

Our pupil's clothes cannot be too light and easy. If tight and close, they fetter and confine his joints and limbs, and likewise obstruct the circulation of the blood; if accustomed to warm clothing, he will soon become incapable of bearing cold.

In every thing let him be habituated to what is ³⁰ plain and hardy. Let his bed be coarse and hard, his ^{Exposure-} clothes plain, his fare simple. Infants must be freely ^{and exer-} indulged in sleep: but as Emilius is now advanced beyond infancy, he must be accustomed at times to go to bed late and get up early, to be sometimes hastily waked from sleep; and thus to prepare himself for what he may afterwards have occasion to submit to in the course of life.

As this period is in a particular manner that of exercise, and Emilius is encouraged to take as much exercise as he chooses; we must endeavour to prompt, ^{but}

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Education. but without seeming to direct him to such as are most proper. Swimming, though not generally attended to, is yet one of the first which a boy ought to learn. It may, in many occasions in life, be of the greatest advantage, by enabling us to save our own life or the life of others. Emilius shall be taught to swim; he shall be taught whatever can really enlarge the sphere of his power: "could I teach him to fly in the air, I would make him an eagle; if to bear the fire, a salamander."

To exercise the senses is not merely to make use of them; it is to learn to judge by them. Call not your pupil to exert all his strength on every occasion; but let him learn to judge of the truth of the information which he receives from one sense, by having recourse to the evidence of another.

It is not impossible to improve the senses to an higher degree of perfection than that which they usually attain. Blind men generally possess the sense of touch in a more exquisite degree, than we who have also eyes to guide and inform us. But they acquire this superior delicacy and acuteness of sensation, only by their finding it necessary to have more frequent recourse to the information of that sense. Here is then a wide field for improvement and agreeable exercise to our pupil.

³¹ **Darkness and ghosts.** What a variety of useful diversions might he be led to entertain himself with in the course of the night. The hours of darkness are generally hours of terror, not only to men, but also to the brute animals. Even reason, knowledge, and courage, are not always sufficient to render us superior to the terror which darkness inspires.

This timidity is usually attributed to the tales of ghosts and goblins with which we are frightened in infancy. But it originates from another cause; our ignorance of what is passing around us, and our inability to distinguish objects during that period of darkness. The passion of fear was implanted by nature in the human breast, in order that it might serve to put us on our guard against danger. But in consequence of our being subject to the influence of that passion, when we are ignorant of what surrounds us, imagination calls up dangers on all hands. And such is the cause from which our terror in darkness naturally arises.

But the only way to free our pupil from this tyranny of imagination, is to oppose to it the power of habit. A bricklayer or tyler is never giddy on looking down from the roofs of houses. Neither will our pupil be alarmed by the terrors of darkness, if he be accustomed to go frequently abroad under night. It is easy to contrive a number of little amusements, the agreeableness of which may, for a time, overcome our pupil's aversion for darkness; and thus may a habit be at length impressed.

Let us give yet another instance of the means by which children may be led to do what we wish, without our imposing any restraint on their will. Suppose Emilius is lazy and inactive, and we wish to make him learn to run. When walking out with the young sloop after dinner, I would sometimes put a couple of his favourite cakes in my pocket; of these each of us should eat one in the course of our walk. After

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some time I would show him I had put a third cake in my pocket. This he would not fail to ask after finishing his own: no, says I, I can eat it myself, or we will divide it;—or stay, we had better let these two little boys there run a race for it. Accordingly I propose the race to the boys; who readily accept the conditions, and one of them carries off the prize. After seeing this several times repeated, Emilius begins to think himself qualified to obtain the third cake as well as any of the little boys, and to look upon running as an accomplishment of some consequence. He seeks an opportunity of being permitted to enter the lists. He runs; and after being two or three times outstripped, is at length successful, and in a short time attains an undoubted superiority.

³² **Drawing.** As children naturally imitate almost whatever they behold, they are often disposed to attempt drawing. In this our pupil might be indulged, not merely for the sake of the art, but to give him a steady hand and a good eye. But he should draw from nature, not from other drawings or from prints. Were he to draw the likeness of a horse, he should look at the animal: if to attempt a representation of a house, he should view the house itself. In this method he will, no doubt, scratch for a long time without producing any likeness: but he will acquire what we proposed as the ends of his attempting to draw; namely, steadiness of hand and justness of sight, by this method, sooner than by any others.

³³ **Geometry.** Geometry, when taught in the usual way, is certainly above the capacity of children; they cannot go along with us in our reasonings: Yet they are not totally incapable of acquiring even this difficult science; if, when they are prosecuting their amusements, you lead them insensibly to observe the properties of the circle, the triangle, and the square, and place them now and then in circumstances when they may have occasion to apply their knowledge of these to real uses in life.

A child has been taught the various relations between the outlines, surfaces, and contents of bodies, by having cakes set before him, cut into all manner of regular solids; by which means he was led to master the whole science of Archimedes, by studying which form contained the greatest quantity.

There is a period between infancy and the age of puberty at which the growth and improvement of our faculties exceed the increase of our desires. About 12 or 13, when the appetite for the sex has not yet begun to make itself felt, when unnatural wants are yet unknown, no false appetites yet acquired; at that period, though weak as a man, as a child the youth is strong.

This interval, when the individual is able to effect more than is necessary for the gratification of his wishes, contains the most precious moments of his life, which ought to be anxiously filled up in an useful manner. This is the best time for employment, for instruction, for study.

Now, let us begin to consider what is useful; for, hitherto, we have only inquired what was necessary. In entering on our studies, we will make no account of any but such as instinct directs us to pursue: those which the pedants and the pretended philosopher are im-

Education. impelled to pursue solely from the desire of attracting the admiration of mankind, are unworthy of our notice.

The earth which we inhabit, and the sun by whose beams we are enlightened, are the first objects which claim our attention. We will therefore direct the attention of our pupil to the phenomena of nature. We will lead him to the knowledge of geography, not by maps, spheres, and globes: we will lead Emilius out on some beautiful evening to behold the setting sun. Here we take particular notice of such objects as mark the place of his going down. Next morning we visit the spot to contemplate the rising of the glorious luminary. After contemplating for some time the successive appearances which the scene before us assumes, and making Emilius observe the hills and the other surrounding objects, I stand silent a few moments, affecting to be occupied in deep meditation: At last I address him thus: "I am thinking, that, when the sun set last night, it went down yonder; whereas this morning, you see he is risen on the opposite of the plain here before us. What can be the meaning of this?" I say nothing more at this time, but rather endeavour to direct his attention to other objects.

This is our first lesson in cosmography.

Our last observation was made about Midsummer; we will next view the rising sun on some fine morning in the middle of winter. This second observation shall be made on the very same spot which we chose for the former. When Emilius and I perceive the sun now emerging above the horizon, we are struck at the change of the place of his rising.—By such lessons as these may the pupil be gradually taught a real, not a seeming, acquaintance with the relative motions of the sun and the planets and with geography.

34
Objects during the second period of childhood.

During the first period of childhood, the great object of our system of education was to spend our time as idly as possible, in order that we might avoid employing it to an ill purpose: but our views are now changed with our pupil's progress in life; and we have scarce enough of time for the accomplishment of our necessary pursuits. We therefore proceed as quickly as possible in making ourselves acquainted with the nature of the bodies around us, and the laws by which their motions and appearances are regulated. We keep to this study at present, as being necessary for the most important purposes in life, and as being the most suitable to the present state of our pupil's powers. We still begin with the most common and obvious phenomena of nature, regarding them as mere facts; and, advancing from these, we come to generalize by degrees.

As soon as we are so far advanced as to be able to give our pupil an idea of what is meant by the word *useful*, we have attained a considerable influence over his future conduct. On every occasion after this a frequent question between us will be, Of what use is that? This shall be the instrument by means of which I shall now be able to render him absolutely submissive to my wishes. However, I will allow him to make use of it in his turn, and will be careful not to require of him to do or learn any thing the utility of which he cannot comprehend.

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Books only teach people to talk about what they do not understand. Emilius shall have as little recourse as possible to books for instruction. Yet if we can find a book in which all the natural wants of man are displayed in a manner suitable to the understanding of a child, and in which the means of satisfying those wants are gradually displayed with the same ease and simplicity; such a book will be worthy of his most attentive study. There is such a book to be found; but it is neither Aristotle, nor Pliny, nor Buffon; it is Robinson Crusoe. Emilius shall have the adventures of Robinson put into his hands: he shall imitate his example; even affect his dress; and, like Robinson, learn to provide for himself without the aid of others.

35
Robinson Crusoe.

Another employment of Emilius at this period shall be, to visit the shops of various artisans; and when he enters a shop, he shall never come out without lending a hand to the work, and understanding the nature and the reason of what he sees going forward.

Still, however, we are careful to afford not a hint concerning those social relations the nature of which he is not yet able to comprehend.

The value and importance of the various arts are ordinarily estimated, not according to their real utility, but by a very injudicious mode of estimation: Those which contribute in a particular manner to the gratification of the fantastic wishes of the rich, are preferred to those which supply the indispensable necessities of life. But Emilius shall be taught to view them in a different light. Robinson Crusoe shall teach him to value the stock of a petty ironmonger above that of the most magnificent toy-shop in Europe. Let us establish it as a maxim, that we are to lead our pupil to form just notions of things for himself, not to dictate to him ours. He will estimate the works both of nature and art by their relation to his own convenience; and will therefore regard them as more precious than gold—a shoemaker or a mason, as a man of more importance than the most celebrated jeweller in Europe.

The intercourse of the arts consists in the reciprocal exchange of industry; that of commerce, in the exchange of commodities; and that of money, in the exchange of bills and cash. To make our pupil comprehend the nature of these, we have now only to generalize and extend to a variety of examples those ideas of the nature of property, and of the exchange of property, which we formerly communicated to him. The nature of money, as bearing only a conventional value, which it derives from the agreement of men to use it as a sign for facilitating commerce, may be now explained to Emilius, and will be easily comprehended by him. But go no farther: seek not yet to explain to the child in what manner money has given rise to the numerous chimeras of prejudice and caprice; nor how countries which abound most in gold and silver, come to be the most destitute of real wealth.

Still our views are directed to bring up our pupil in such a manner that he may be qualified to occupy any place in the order of society into which even the caprice of fortune can throw him. Let us make him a man; not a slave, a lord, or a monarch. How much superior the character of a king of Syracuse turned

U u

schoolmaster

Education. schoolmaster at Corinth, of a king of Macedon become a notary at Rome, to an unhappy Tarquin incapable of supporting himself in a state of independence when expelled from his kingdom!

36
The propriety of making a young man, in whatever sphere of life, learn a trade.

Whatever be our situation in the world, we can contribute nothing but our personal abilities to society. To exert them is therefore the indispensable duty of every one who enjoys the advantages of a social state; and to cultivate them in our pupil to the best purpose, ought to be the great aim of every course of education. Emilius has already made himself familiar with all the labours of husbandry; I can therefore bid him cultivate the land which he inherits from his father. But if it should be lost, what shall be his resource? He shall learn a trade, that he may be provided against such an accident. And he shall not be a politician, a painter, a musician, or an architect; to gain employment for his talents in any of these arts, would cost him no less trouble than to regain his lost estate. He shall learn some simple mechanical art: he will then need only to step into the first shop he sees open, to perform his day's labour, and receive his wages.

It may be here proper to take notice of a mistake into which people generally fall in determining the trade or profession in which they are to place their children. Some accident disposes the child to declare himself for a particular employment: the parent regards that as the employment to which his talents are fitted by the design of nature; and permits him to embrace it without inquiring whether another would have been more suitable or advantageous. But because I am pleased with my occupation, I am not on that account necessarily qualified for it. Inclinations do not confer abilities. It requires more careful and accurate observation than is generally imagined, to distinguish the particular taste and genius with which nature has endowed the mind of a child. We view him carelessly, and of consequence we are apt to mistake casual inclination for original disposition.

But Emilius needs not now to hesitate about the occupation which he is to choose. It is to be some mechanical employment. All the distinction we have now to make is, to prefer one that is cleanly and not likely to be injurious to his health. We shall make choice of that of a joiner. We cannot dedicate all our time to the trade; but at least for two days in the week we will employ ourselves in learning our trade. We will have no workshop erected for our convenience, nor will we have a joiner to wait on us in order to give us the necessary instructions: but for the two days in every week which we dedicate to the purpose of learning a trade, we will go to our master's workshop; we will rise before him in the morning; work according to his orders; eat at his table; and, after doing ourselves the honour of supping with his family, return to our own hard mattresses at night. We shall be treated only according to the merit of our performances. Our master shall find fault with our work when clumsily or negligently done, and be pleased with it only when well executed.

37
New ideas suggested to Emilius by his application to a trade.

While my pupil has been accustomed to bodily exercise and manual labour, his education has been hitherto conducted in such a manner as to give him insensibly a taste for reflection and meditation. Before he has been long a workman, therefore, he will begin

to become more sensible of that inequality of ranks which takes place in the order of society. He will therefore take notice of his own dependence, and of my apparent wealth, and will be desirous to know why I contribute not my personal exertions to society. I put off the question with telling him, that I bestow my superfluous wealth on him and the poor; and will take to make a bench or table every week, that I may not be quite useless to the public.

And now when about to enter the most critical period of life, when just on the brink of that age at which the heart and blood begin to feel the impulse of a new appetite, what progress has our pupil made? what knowledge has he acquired? All his science is merely physical. Hitherto he has scarce acquired any ideas of moral relations; but the essential relations between men and things he has attentively studied. He knows the general qualities of certain bodies; but upon those qualities he has not attempted to reason. He has an idea of abstract space, by means of geometrical figures; of abstract quantity, by means of algebraical signs. He has no desire to find out the essence of things; their relations alone interest him. He values nothing external but from its relation to himself. The general consent of mankind, or the caprice of custom, have not yet given any thing a value in his eyes; utility alone is his measure of estimation. He is laborious, temperate, patient, resolute, and bold. His imagination never exaggerates danger. He scarce knows as yet what death is; but should it approach him, he is prepared to submit to necessity. He is virtuous in every thing relative merely to himself. He is prepared to become a virtuous member of society as soon as he shall be made acquainted with the nature of his social relations. He is free from vice and error as far as is possible for human nature. He considers himself as unconnected with others; requires nothing from any person, and thinks none has a right to require any thing of him. Sure a youth arrived thus at his fifteenth year has not mispent the period of his infancy.

But now our pupil has reached the most critical period of life. He now feels the influence of the passion for the sex; and as soon as we become subject to the influence of that passion, we are no longer unsocial beings. The want of a mistress soon produces the want of a friend.

As hitherto we have been careful not to force or anticipate nature, so even now our attention must be directed to divert the impulses of that dangerous appetite which now begins to make itself felt. To confine the growing passions within proper limits, let it be our care to defer as long as possible the time at which they begin to display themselves. For this purpose, let us cautiously guard our words and actions in the presence of our pupil. Let us be careful to give him no premature instructions.

To excite and cherish that sensibility of mind which now first begins to show itself, to extend the care of the youth beyond himself, and to interest him in the welfare of his fellow creatures; let us be careful to put such objects in his way as have a tendency to call forth and refine the feelings. It is not possible for the human heart to sympathise with those who are happier than ourselves: our sympathy is moved only by the sight of misery. We pity in others only those distresses

38
Progress that Emilius has made before the age of puberty.

39
New measures to be adapted in his education at that age.

See

Education. ses to which we ourselves are liable ; and our pity for the misfortunes of others is measured, not by the quantity of the evil, but by the supposed sensibility of the sufferer. Let these observations serve to direct us in what manner we are to form the minds of children to humanity and compassion.

In prosecution of our design, to retard rather than accelerate the growth of the passions, let us, when that critical period which we have so much feared comes on, seclude him as much as possible from the intercourse of society, where so many objects appear to inflame the appetites. Let us be circumspect in the choice of his companions, his employment, his pleasures. Let all our care be directed to nourish his sensibility without inflaming his desires. As his moral powers now begin to unfold themselves; in cultivating them, let us proceed not by way of lecture, or by directing his attention to books, but still by leading him to acquire experience. At length the period will arrive for communicating to him some religious instruction. When he knows the nature of his relations to society, he may be informed of his relation to and dependence upon a Deity.

[The creed of the Savoyard curate, containing those sentiments concerning religious matters which Rousseau seems to propose as the most proper to be inculcated on his pupil, comes next in the order of the work; but it does not appear to be so closely connected with the subject of education as to render it proper for us to give a view of it in this place. The sentiments which he there advances, the reasonings which he urges, are evidently hostile to revealed religion; and the power of his eloquence has adorned slight and superficial arguments with such a charm, that even the sternest believer, if not absolutely destitute of taste and feeling, must read them with delight.]

And now, notwithstanding all my arts, I can no longer keep back that moment which I have endeavoured to defer to as late a period as possible. As soon as I perceive that it has certainly arrived, I no longer treat Emilius as my pupil or disciple, but as my friend. His affections are now expanded beyond himself; his moral powers have begun to exert themselves, and have received some cultivation; he also is become capable of religious sentiments, and instructed in the nature of his relation to a supreme Being. Besides, it is now requisite, if we consider the period to which nature has conducted him, that he should no longer be treated as a simple child. Hitherto ignorance has been his guardian, but now he must be restrained by his own good sense.

Now is the time for me to give him in my accounts; to show him in what manner his time and mine have been employed; to acquaint him with his station and mine, with our obligations to each other, his moral relations, the engagements he has entered into with regard to others, the degree of improvement which he has attained, the difficulties he will hereafter meet with, and the means by which he may surmount them:—in a word, to point out to him his critical situation, and the new perils which surround him; and to lay before him all the solid reasons which should engage him to watch with the utmost attention over his conduct, and to be cautious of indulging his youthful desires.

Books, solitude, idleness, a sedentary and effeminate life, the company of women and young people, are what he must carefully avoid at this age. He has learned a trade, he is not unskilled in agriculture; these may be means, but not our only means, for preserving him from the impulse of sensual desire. He is now too familiar with these: he can exercise them without taking the trouble to reflect; and while his hands are busy, his head may be engaged about something quite different from that in which he is employed. He must have some new exercise which may at once fix his attention and cause him to exert his bodily powers. We can find none more suitable for this purpose than hunting. Now, therefore, Emilius shall eagerly join in the chase; and though I do not wish him to acquire that cruelty of disposition and ferocity of temper which usually distinguish those who dedicate their lives to that barbarous diversion, yet at present it may have the happiest effects in suspending the influence of the most dangerous of passions.

When I have now conducted my pupil so far; have informed him of what I have done for him, and of the difficulty of his situation; and have resigned my authority into his hands; he is so sensible of the dangers to which he is exposed, and of the tender solicitude with which I have watched over him, that he still wishes to continue under my direction. With some feigned difficulty I again resume the reins. My authority is now established. I may command obedience; but I endeavour to guard against the necessity of using it in this manner.

To preserve him from indulging in licentious pleasures, I let him know that nature has designed us for living in a state of marriage, and invite him to go in search of a female companion. I will describe to him the woman whom he is to consider as worthy of his attachment in the most flattering colours. I will array her in such charms, that his heart shall be hers before he has once seen her. I will even name her: her name shall be Sophia. His attachment to this imaginary fair one will preserve him from all the allurements of unlawful love. Besides, I take care to inspire him with such reverence for himself, that, notwithstanding all the fury of his desires, he will not condescend to pursue the enjoyments of debauchery. And though I may now sometimes entrust him to his own care, and not seek to confine him always under my eye; yet still I will be cautious to watch over his conduct with careful circumspection.

But as Emilius is to be shortly introduced to his Sophia, it may perhaps be proper for us to inquire into her character, and in what manner she has been brought up.

There is a natural difference between the two sexes. Distinctive characters of the two sexes. The difference in the structure of their bodies shows them to be destined by nature for different purposes in life, and must necessarily occasion a distinction between their characters. It is vain to ask which of them merits the pre-eminence: each of them is peculiarly fitted to answer the views of nature. Woman is naturally weak and timid, man strong and courageous; the one is a dependent, the other a protector. As the guardian of her virtue, and a restraint on her desires, woman is armed with native modesty. Reason is the guide and governor of man. When a man and a wo-

Education. man are united by conjugal vows, a violation of those vows is evidently more criminal in the woman than in the man. The wife ought to be answerable for the genuineness of the offspring with which she has been entrusted by nature. It is no doubt barbarous and wicked for the husband to defraud his wife of the only reward which she can receive for the severe duties of her sex: but the guilt of the faithless wife is still more atrocious; and the consequences of her infidelity are still more unhappy.

But if nature has established an original distinction between the characters of the two sexes; has formed them for different purposes, and assigned them different duties; it must follow, that the education of the one sex ought to be conducted in a manner different from that of the other. The abilities common to the two sexes are not equally divided between them; but if that share which nature has distributed to woman be scantier than what she has bestowed on man, yet the deficiency is more than compensated by the qualities peculiar to the female. When the woman confines herself to assert her proper rights, she has always the advantage over man; when she would usurp those of the other sex, the advantage is then invariably against her.

But we require not that woman should be brought up in ignorance. Let us consider the delicacy of her sex, and the duties which she is destined to perform; and to these we may accommodate the education which we bestow upon her. While boys like whatever is attended with motion and noise, girls are fond of such decorations as please the eye. Dolls are the favourite plaything of the sex in their infant years. This is an original taste, of the existence of which we have the plainest evidence. All therefore that we ought to do is, to trace and bring it under proper regulation. Allow the girl to decorate her baby in whatever manner she pleases; while employed about that, she will acquire such skill and dexterity in those arts which are peculiar to her sex, that with scarce any difficulty she will acquire needle-work, embroidery, and the art of working lace. Her improvements may even be extended as far as designing, an art somewhat connected with taste in dress; but there is no reason that their skill in this art should be carried farther than to the drawing of foliage, fruits, flowers, drapery, and such parts of the art as bear some relation to dress. Always assign reasons for the employment which you give to young girls, but be sure you keep them constantly busy. They ought to be accustomed to laborious industry, as well as to bear the abridgment of their liberty. Use every art to prevent their work from becoming disagreeable to them. For that purpose, let the mother be careful to make herself agreeable. A girl who loves her mother or her aunt, will work cheerfully by them all day; while she to whom her mother is not dearer than all the world besides, seldom turns out well. Never suffer girls, even at their diversions, to be entirely free from restraint, nor allow them to run from one amusement to another. If you now and then detect your daughter using a little artifice to excuse herself from obedience, reflect that artifice is, in a certain degree, natural to the fair sex; and as every natural inclination, when not abused, is upright and good, why should it not be cultivated? In order to

give girls proper notions of dress, let them be taught to consider splendor and elegance of dress as designed only to conceal the natural defects of the person; and to regard it as the noblest triumph, the highest praise, of beauty, to shine with unborrowed lustre in the simplest attire. Forbid not young women to acquire those arts which have a tendency to render them agreeable. Why refuse them the indulgence of learning to dance, to sing, and to study such other accomplishments as afterwards enable them to entertain their husbands? Girls are more disposed to prattle, and at an earlier age, than boys. We may now and then find it necessary to restrain their volubility. But the proper question to them on such occasions is not, as to boys, *Of what use is this?* but, *What effects will this produce?* At this early period, when they are yet strangers to the distinction between good and evil, and therefore unable to form a just judgment concerning any person's conduct, we ought to restrain them carefully from saying what may be disagreeable to those with whom they converse.

Girls are no less incapable than boys of forming distinct notions of religion at an early age. Yet, and even for that very reason, religious instruction should be communicated to them much sooner than to the youth of the other sex. Were we to wait the period when their mental faculties arrive at maturity, we might perhaps lose the happiest time, from our inability to make a right distinction. Since a woman's conduct is subject to public opinion, her belief ought therefore to depend, not on reason, but on authority. Every girl ought to follow the religion of her mother, every married woman that of her husband. They cannot derive a rule of faith from their own inquiry. Let us therefore seek, not so much to instruct them in the reasons of our belief, as to give them clear distinct notions of those articles which we require them to believe. Be more careful to instruct her in those doctrines which have a connection with morality, than in those mysterious articles which we are required to believe, though we cannot comprehend them.

Such are the principles on which the education of Emilius's unknown mistress has been conducted.

[Notwithstanding the merit of that part of this treatise in which the author entertains us with the courtship between his Emilius and Sophia, it does not appear to be so intimately connected with the subject of education as to render it proper for us to present our readers with a view of it. We therefore pass over the courtship, to give a view of our author's sentiments concerning the advantages to be derived from travelling, and the manner in which it ought to be directed.]

When Emilius has formed a firm attachment to Sophia, and by his assiduities has been so fortunate as to gain her affections, his great wish now is, to be united with her in the bonds of marriage. But as he is still young, is but imperfectly acquainted with the nature of those duties incumbent on him as a member of a particular society, and is even ignorant of the nature of laws and government, I must separate him from Sophia, and carry him to gain a knowledge of these things, and of the character and circumstances of mankind, in various countries, and under various forms of civil government, by travelling. Much has been said

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Education. concerning the propriety of sending young people to travel, in order to complete their education. The multiplicity of books is unfavourable to real knowledge. We read with avidity, and think that by reading we render ourselves prodigiously wise. But we impose on ourselves: the knowledge which we acquire from books is a false species of knowledge, that can never render us truly wise.

To obtain real knowledge, you must observe nature with your own eyes, and study mankind. But to gain this knowledge by travelling, it is not necessary that we should traverse the universe. Whoever has seen ten Frenchmen, has beheld them all; and whoever has surveyed and compared the circumstances and manners of ten different nations, may be said to know mankind.

To pretend that no advantages may be derived from travelling, because some of those who travel return home without having gained much real improvement, would be highly unreasonable. Young people who have had a bad education, and are sent on their travels without any person to direct or superintend their conduct, cannot be expected to improve by visiting foreign countries. But they whom nature has adorned with virtuous dispositions, who have been so happy as to receive a good education, and go abroad with a real design of improvement, cannot but return with an increase of virtue and wisdom. In this manner shall Emilius conduct his travels. To induce him to improve in the most attentive manner that time which he should spend in travelling, I would let him know, that as he had now attained an age at which it might be proper for him to form some determination with regard to the plan of his future life, he ought therefore to look abroad into the world, to view the various orders in society, to examine the various circumstances of mankind, under different forms of government, and in different parts of the globe; and to choose his country, his station, and his profession. With these views should Emilius set out on his travels; and with these views, in the course of our travels, we should inquire into the origin of society and government, into the nature of those principles by means of which men are united in a social state, into the various circumstances which have given rise to so many different forms of government, and into the necessary relation between government and manners. Our stay in the great towns should be but short: for as in them corruption of manners has risen to a great height, and dissipation reigns, a long stay in any great town might be fatal to the virtuous dispositions of Emilius. Yet his attachment to Sophia would alone be sufficient to save him from the dangers to which his virtue is exposed. A young man must either be in love, or be a debauchee. Instances may be pointed out in which virtue has been preserved without the aid of love; but to such instances I can give little credit.

44.
Return
from his
travels, and
marriage.

Emilius, however, may now return to his Sophia. His understanding is now much more enlightened than when he set out on his travels. He is now acquainted with several forms of government, their advantages and defects, with the characters of several different nations, and with the effects which difference in circumstances may be expected to produce on the characters of nations. He has even been so fortunate as to get acquainted with some persons of merit in each of the

countries which he has visited. With these advantages gained, and with affection unchanged and unabated, he returns to his Sophia. After having made him acquainted with the languages, the natural history, the government, the arts, customs, and manners, of so many countries, Emilius eagerly informs me that the period which we had destined for our travels is now expired. I ask, What are then his purposes for life? He replies, that he is satisfied with the circumstances in which nature has placed him, and with my endeavours to render him independent on fortune, and wishes only for his Sophia to be happy. After giving him a few advices for the regulation of his conduct in life, I conduct him to his Sophia, and behold him united with her in marriage. I behold him happy; with affectionate gratitude he blesses me as the author of his happiness; and I thus receive the reward of all the pains with which I have conducted his education.

Such are the outlines of the system of education proposed by this singular and original genius. For originality of thought, affecting sentiment, enchanting description, and bold vehement eloquence, this book is one of the noblest pieces of composition, not only in the French language, but even in the whole compass of ancient and modern literature. The irregularity of his method, however, renders it a very difficult task to give an abridged view of his work. He conducts his pupil, indeed, from infancy to manhood: But instead of being barely a system of education, his work is besides a treasure of moral and philosophical knowledge. He has chosen a path, and follows it from the bottom to the summit of the hill: yet whenever a flower appears on the right or left hand, he eagerly steps aside to pluck it; and sometimes, when he has once stepped aside, a new object catches his eye and seduces him still farther. Still, however, he returns. His observations are in many places loosely thrown together, and many things are introduced, the want of which would by no means have injured either the unity or the regularity of his work. If we attempt to review the principles on which he proceeds in reprobating the prevalent modes of education, and pointing out a new course, his primary and leading one seems to be, that we ought to watch and second the designs of nature, without anticipating her. As the tree blossoms, the flowers blow and the fruit ripens each at a certain period; so there is a time fixed in the order of nature for the sensitive, another for the intellectual, and another for the moral powers of man to display themselves. We in vain attempt to teach children to reason concerning truth and falsehood, concerning right and wrong, before the proper period arrive: We only confound their notions of things, and load their memories with words without meaning; and thus prevent both their reasoning and moral powers from attaining that strength and acuteness of which they are naturally capable. He attempts to trace the progress of nature, and to mark in what manner she gradually raises the human mind to the full use of all its faculties. Upon the observations which he has made in tracing the gradual progress of the powers of the human mind towards maturity, his system is founded.

As it is impossible to communicate to the blind any just ideas of colours, or to the deaf of sounds; so it must be acknowledged, that we cannot possibly communicate

45.
Remark 2.

Education. communicate to children ideas which they have not faculties to comprehend. If they are, for a certain period of life, merely sensitive animals, it must be folly to treat them during that period as rational and moral beings. But is it a truth that they are, during any part of life, guided solely by instinct, and capable only of sensation? Or, how long is the duration of that period? Has nature unkindly left them to be, till the age of twelve, the prey of appetite and passion? So far are the facts of which we have had occasion to take notice, concerning the history of infancy and childhood, from leading to such a conclusion, that to us it appears undeniable that children begin to reason very soon after their entrance into life. When the material world first opens on their senses, they are ignorant of the qualities and relations of surrounding objects: they know not, for instance, whether the candle which they look at be near or at a distance; whether the fire with which they are agreeably warmed may also affect them with a painful sensation. But they remain not long in this state of absolute ignorance. They soon appear to have acquired some ideas of the qualities and relative situation of bodies. They cannot, however, acquire such ideas, without exerting reasoning powers in a certain degree. Appearances must be compared, and inferences drawn, before knowledge can be gained. It is not sensation alone which informs us of the relative distances of bodies; nor can sensation alone teach us, that the same effects which we have formerly observed will be again produced by the same cause.

But if children appear capable of reasoning at a very early period, they appear also to be at a very early period subject to the influence of the passions: they are angry or pleased, merry or sad, friends or enemies, even while they hang at the breast; instead of being selfish, they are naturally liberal and social. And if we observe them with candid attention, we will find that the passions do not display themselves sooner than the moral sense. As nature has wisely ordered, that we should not see, and hear, and feel, without being able to compare and draw inferences from our perceptions; so it is a no less certain and evident law of nature, that the passions no sooner begin to agitate the human breast, than we become able to distinguish the beauty and the deformity of virtue and vice. The child is not only capable of gratitude and attachment to the person who treats him with kindness; he is also capable of distinguishing between gratitude and ingratitude, and of viewing each with proper sentiments. He cries when you refuse to gratify his desires; but he boldly insists that he is injured when you use him cruelly or unjustly. It is indeed impossible to attend to the conduct of children during infancy, without being convinced that they are, even then, capable of moral distinctions. So little are they acquainted with artificial language, that we and they do not then well understand each other. But view their actions; consider those signs by which nature has taught them to express themselves. Our limbs, our features, and our senses, are not gradually and by piecemeal bestowed as we advance towards maturity; the infant body comes not into the world mutilated or defective: why then, in point of mental abilities, should we be for a while brutes, without becoming rational and moral beings till the fulness of time be accomplished? All the differences between the

phenomena of manhood and those of infancy and childhood may be accounted for, if we only reflect, that when children come into the world, they are totally unacquainted with all the objects around them; with the appearances of nature, and the institutions of society; that they are sent into the world in a feeble state, in order that the helplessness occasioned by their ignorance may attract the notice and gain the assistance of those who are able to help them; and that they attain not full strength in the powers either of mind or body, nor a sufficient acquaintance with nature, with artificial language, and with the arts and institutions of society, till they arrive at manhood.

Even Rousseau, notwithstanding the art with which he lays down his system, cannot avoid acknowledging indirectly, on several occasions, that our social dispositions, our rational and our moral powers, display themselves at an earlier period than that at which he wishes us to begin the cultivation of them.

But though the great outlines of his system be merely theory, unsupported by facts, nay plainly contradictory to facts; yet his observations on the impropriety or absurdity of the prevalent modes of education are almost always just, and many of the particular directions which he gives for the conducting of education are very judicious. He is often fanciful, and often deviates from the common road, only to show that he is able to walk in a separate path. Yet why should he be opposed with so much virulence, or branded with so many reproachful epithets? His views are liberal and extensive: his heart seems to have glowed with benevolence: his book contains much observation of human actions; displays an intimate acquaintance with the motives which sway the human heart; and if not a perfect system for education, is yet superior to what any other writers had before done upon the subject. It is surely true, that we ourselves often call forth evil passions in the breasts of children, and impress them with bad habits: it is no less true that we put books in their hands, and load their memory with words, when we ought rather to direct their attention to things, to the phenomena of nature, and the simplest arts of life. The form in which he has chosen to communicate his sentiments on the subject of education renders the perusal of it more pleasing, and his precepts more plain, than they would otherwise have been: it is nearly that dramatic form with which we are so much delighted in some of the noblest compositions of the ancients.

After viewing the public establishments for education which existed in some of the most renowned states of antiquity; and after listening to the sentiments of the experienced Quintilian, the learned Milton, the judicious Locke, and the bold fanciful Rousseau, on this interesting subject; it may now be proper to lay before the reader our own sentiments concerning the education of youth under a few distinct heads.

Indeed, if we were disposed to give abridgments of all the books which have been written on the subject of education, or even to hint at all the various modes which have been recommended by teachers or theorists, we might swell this article to an amazing size: Nay, were we only to take notice of the many elegant and sensible writers who have of late endeavoured to call the attention of the public to this subject, we might extend it to an immoderate length. A Kames, a Priestley,

Education. ley, a Knox, a Madame de Sillery, and a Berquin, might well attract and fix our attention. But as, among such a crowd of writers, every thing advanced by each cannot be original; and even of those things which are original only a certain, and that perhaps even a moderate, proportion, can be just and judicious; and as they often either borrow from one another, or at least agree in a very friendly manner, though in some things they profess a determined hostility; therefore we shall content ourselves with having taken notice of four of the most respectable writers on the subject.

In presenting to our readers the result of our own observations and reflections, we shall throw our thoughts nearly under the following heads. The management of children from their birth till they attain the age of five or six; from that period till the age of puberty; and from that age till manhood; private and public education; religion and morals; the languages; natural philosophy; the education of people of rank and fortune; education of persons designed for a mercantile employment, and for the other humbler occupations in active life not particularly connected with literature; education of the female sex; foreign travel; knowledge of the world; and entrance into active life. We do not pretend to be able to include under these heads every thing worthy of notice in the subject of education: but under these we will be able to comprehend almost every thing of importance that has occurred to us on the subject.

I. *On the Management of Infants from the Time of their Birth till they attain the Age of five or six.*

THE young of no other animal comes into the world in so helpless a state, or continues so long to need assistance, as that of the human species. The calf, the lamb, and the kid, are vigorous and lively at the instant of their birth; require only, for a very short period, nourishment and protection from their respective dams; and soon attain such degrees of strength and activity as to become entirely independent. The infancy of the oviparous animals is not of longer continuance: And, indeed, whatever department of the animal world we may choose to survey, we still find that no species is subject to the same severe laws as man during the first period of life.

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Man compared to other animals, in respect to the helplessness of infancy.

Yet the character and the views of man are so very different from those of the other animals, that a more careful attention to these may perhaps induce us to regard this seeming severity rather as an instance of the peculiar kindness of the Author of nature. From every observation which has been hitherto made on the powers and operations of the inferior animals, we are led to consider them as guided and actuated chiefly, if not solely, by instinct, appetite, and sensation: their views extend not beyond the present moment; nor do they acquire new knowledge or prudence as they advance in life. But the character of the human race is much more exalted. We have also powers and organs of sensation, instincts and appetites; but these are the most ignoble parts of our nature: our rational faculties and moral powers elevate us above the brutes, and advance us to an alliance with superior beings. These rational faculties and moral powers render us capable of social life, of artificial language, of art, of science, and of religion. Now, were one of the species to come into the world full grown, possessed of that bodily strength and vigour

Education. which distinguishes manhood, his ignorance would still render him inadequate to the duties of life; nay, would even render him unable to procure means for his subsistence: while his manly appearance would deprive him of the compassion and benevolent assistance of others; and his strength and vigour would also render him less docile and obedient than is necessary, in order that he may receive instruction in the duties and arts of life. Again, were the period of infancy as short to the human species as to the other animals; were we to be no longer subjected to a parent's authority, or protected by his care, than the bird or the quadruped; we should be exposed to the dangers and difficulties of the world before we had acquired sufficient knowledge or prudence to conduct us through them, before we had gained any acquaintance with the ordinary phenomena of nature, or were able to use the language or practise the arts of men in a social state.

Since, then, it is by the benevolence of nature that we are feeble and helpless at our entrance into life, and that our progress towards maturity is slow and gradual; since nature has destined us to be for a considerable time under the care and authority of our parents; and since the manner in which we are managed during that early part of life has so important an influence on our future character and conduct: it is therefore incumbent on parents to direct that tenderness, which they naturally feel for their offspring, in such a manner as to second the views of nature.

When children come into the world, instinct directs them to receive nourishment from the breast, and to claim attention to their pains and wants by crying. We attend to their signs, and strive to render them as easy as we can. They are washed, clothed with such garments as we think most suitable, and suckled either by their mother or by some other woman who is considered as proper for the purpose. The absurd mode of swaddling up infants in such a manner as to confine them almost from all motion, and leave scarce a limb at liberty, which has been so often exclaimed against and represented as highly injurious to the symmetry and vigour of the human frame, is now almost entirely laid aside; and therefore we need not raise our voice against it. Still, however, there are certainly too many pins and bandages used in the dress of infants: these are unfavourable to the circulation of the blood, impede the growth, and often occasion those tears and that peevishness which we rashly attribute to the natural ill-humour of the poor creatures. Their dress ought to be loose and cool, so as to press hard on no joint, no vein nor muscle; and to leave every limb at liberty. If too heavy and close, it may occasion too copious a perspiration, and at the same time confine the matter perspired on the surface of the skin; than which nothing can be more prejudicial to the health of the child. It may also, however, be too thin and cool: for as moderate warmth is necessary to the vegetation of plants; so it is no less necessary for promoting the growth of animals: and, therefore, though the dress of infants ought to be loose and easy, yet still it should be moderately warm.

It is common for mothers in affluent or even in comfortable circumstances, to forego the pleasure of nursing their own children, that they may avoid the fatigues with which it is attended. This practice has long prevailed in various ages and among various nations.

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Nurses.

Education. tions: it has been often reprobated with all the warmth of passion, and all the vehemence of eloquence, as dishonourable, inhuman, contradictory to the designs of nature, and destructive of natural affection: yet still it prevails; fathers and mothers are still equally deaf to the voice of nature and the declamations of philosophers. Indeed, in a luxurious age, such a practice may be naturally expected to prevail. In such an age, they who are possessed of opulence generally persuade themselves, that, to be happy, is to spend their time wholly amid diversions and amusements, without descending to useful industry, or troubling themselves about the ordinary duties of life. Influenced by such notions, they think it proper for them to manage their family affairs, and to nurse and educate their children, by proxy; nay, to do for themselves nothing that another can perform for them. It is vain to make a furious opposition to these absurd notions; the false views of happiness, the pride and the indolence produced by luxury, will still be too powerful for us. We must not hope to persuade the mother, that to receive the caresses, to behold the smiles, and to mark the bodily and mental powers of her child in their gradual progress towards maturity, would be more than a sufficient compensation for all the fatigues which she would undergo in nursing and watching over him in his infant years. We need not mention, that the mutual affection between a mother and her child, which is partly the effect of instinct, depends also, in no inconsiderable degree, on the child's spending the period of infancy in its mother's arms; and that when she substitutes another in her place, the child naturally transfers its affection to the person who performs to it the duties of a mother. We need not urge these, nor the various other reasons which seem to recommend to every mother the province of suckling her own children, and watching over their infant years; for we will either not be heard, or be listened to with contempt. Yet we may venture to suggest, that if the infant must be committed to a stranger, some degree of prudence may be employed in selecting the person to whom he is to be entrusted. Her health, her temper, and her manner of speaking, must be attended to. A number of other qualifications are also to be required in a nurse: but it is rather the business of the physician to give directions with regard to these. If her habit of body be any way unhealthy, the constitution of the infant that sucks her milk cannot but be injured: if her temper be rough or peevish, the helpless child subjected to her power will be often harshly treated; its spirit will be broken, and its temper soured: if her pronunciation be inarticulate or too rapid, the child may acquire a bad habit when it first begins to exert its vocal organs, which will not be easily corrected.

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Influence of
treatment
in infancy
on the abi-
lities and
dispositions.

In the milder seasons of the year, infants ought to be frequently carried abroad. Not only is the open air favourable to health, but the freshness, the beauty, the variety, and the lively colours of the scenes of nature, have the happiest effects on the temper, and have even a tendency to enliven and invigorate the powers of the mind. At this period, the faculties of the understanding and the dispositions of the heart generally acquire that particular bias, and those distinguishing features, which characterize the individual during the future part of his life, as quick or dull,

N^o 109.

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mild or passionate; and which, though they be generally attributed to the original conformation of the mind by the hand of nature, yet are owing rather to the circumstances in which we are placed, and the manner in which we are treated, during the first part of life.

When children begin to walk, our fondness disposes us to adopt many expedients to assist them. But these seem to be improper. It is enough for us to watch over them so as to guard them from any danger which they might otherwise incur by their first attempts to move about. Those who advise us not to be too anxious to preserve children from those slight hurts to which they are exposed from their disposition to activity, before they have acquired sufficient strength or caution, certainly give a judicious piece of advice which ought to be listened to. By being too attentive to them, we teach them to be careless of themselves; by seeming to regard every little accident which befalls them as a most dreadful calamity, we inspire them with timidity, and prevent them from acquiring manly fortitude. When children begin to lisp out a few words or syllables, the pleasure which we feel at hearing them aim at the use of our language, disposes us to listen to them with such attention as to relieve them from the necessity of learning an open distinct articulation. Thus we teach them to express themselves in a rapid, indistinct, and hesitating manner, which we often find it difficult, sometimes even impossible, to correct, when they are farther advanced. Would we teach them a plain distinct articulation, we ought not only to speak plainly and distinctly in their presence, but also to disregard their questions and requests, if not expressed with all the openness and distinctness of pronunciation of which they are capable.

Man is naturally an imitative animal. Scarce any of our natural dispositions is displayed at an earlier period than our disposition to imitation. Children's first amusements are dramatic performances, imitative of the arts and actions of men. This is one proof among others, that even in infancy our reasoning faculties begin to display themselves; for we cannot agree with some philosophers, that children are actuated and guided solely by instinct in their attempts at imitation.

However that be, the happiest use might be made of this principle which discovers itself so early in the infant mind. Whatever you wish the child to acquire, do in his presence in such a manner as to tempt him to imitate you. Thus, without souring his mind by restraint during this gay innocent period of life, you may begin even now to cultivate his natural powers. Were it impossible at this time to communicate any instruction to the boy, without banishing that sprightly gaiety which naturally distinguishes this happy age, it would be best to think only how he might lose his time in the least disadvantageous manner. But this is far from being necessary. Even now the little creature is disposed to imitation, is capable of emulation, and feels a desire to please those whose kindness has gained his affection. Even now his sentiments and conduct may be influenced by rewards when prudently bestowed, and by punishments when judiciously inflicted. Why then should we hesitate to govern him

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Education by the same principles, by which the laws of God and society assert their influence on our own sentiments and conduct? Indeed, the imprudent manner in which children are too generally managed at this early period, would almost tempt us to think it impossible to instruct them, as yet, without injuring both their abilities and dispositions. But this is owing solely to the carelessness, stupidity, or capricious conduct of those under whose care they are placed.

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Obedience
whether,
and when,
to be ex-
acted.

Is implicit obedience to be exacted of children? and at what period of life should we begin to enforce it? As children appear to be capable both of reasoning and of moral distinctions at a very early age; and as they are so weak, so inexperienced, so ignorant of the powers of surrounding bodies, and of the language, institutions, and arts of men, as to be incapable of supporting or conducting themselves without direction or assistance; it seems therefore proper that they be required even to submit to authority. To the necessity of nature both they and we must on many occasions submit. But if the will of a parent or tutor be always found scarce less unalterable than the necessity of nature, it will always meet with the same respectful submissive resignation. It may not perhaps be always proper to explain to children the reasons for which we require their obedience: because, as the range of their ideas is much less extensive than ours; as they do not well understand our language, or comprehend our modes of reasoning; and as they are now and then under the influence of passion and caprice, as well as people who are farther advanced in life; we are therefore likely to fail in making them comprehend our reasons, or in convincing them that they are well-grounded. And as it is proper to exact obedience of children; so we should begin to require it as soon as they become capable of any considerable degree of activity. Yet we must not confine them like slaves, without allowing them to speak, to look, or to move, but as we give the word. By such treatment we could expect only to render them peevish and capricious. It will be enough, at first, if we let them know that obedience is to be exacted; and if we restrain them only where, if left at liberty, they would be exposed to imminent danger.

If then, at so early a time of life as before the age of five or six, it is possible to render children obedient, and to communicate to them instruction; what arts, or what learning, ought we to teach them at that period? To give a proper answer to this question, is no easy matter. It seems at first difficult to determine, whether we ought yet to initiate them in letters. But as their apprehension is now quick, and their memory pretty tenacious, there cannot be a more favourable time for this very purpose. As soon as they are capable of a distinct articulation, and seem to possess any power of attention, we may with the greatest propriety begin to teach them the alphabet. The most artful, alluring methods may be adopted to render the horn-book agreeable; or we may use the voice of authority, and command attention for a few minutes; but no harshness, no severity, and scarce any restraint. At the same time, it will be proper to allow the little creatures to run much about in the open air, to exercise their limbs, and to cultivate those social dispositions which already begin to appear, by playing with their equals.

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Such are the thoughts which have suggested them. Education. selves to us concerning the management of children in mere infancy. What an amiable little creature would the boy or girl be, who were brought up in a manner not inconsistent with the spirit of these few hints? Behold him healthy and vigorous, mild, sprightly, and cheerful: He is submissive and docile, yet not dull or timid; he appears capable of love, of pity, and of gratitude. His mind is hitherto, however, almost wholly uninformed: he is acquainted but with a few of the objects around him; and knows but little of the language, manners, and institutions of men: but he feels the impulse of an ardent curiosity, and all the powers of his mind are alive and active.

II. On the Management of Children between the Age of five or six and the Age of puberty.

At this period it may be proper, not only to exact obedience, and to call the child's attention for a few minutes now and then to those things of which the knowledge is likely to be afterwards useful to him; but we may now venture to require of him a regular steady application, during a certain portion of his time, to such things as we wish him to learn. Before this time it would have been wrong to confine his attention to any particular task. The attempt could have produced no other effect than to destroy his natural gaiety and cheerfulness, to blunt the native quickness of his powers of apprehension, and to render hateful that which you wished him to acquire. Now, however, the case is somewhat different: The child is not yet sensible of the advantages which he may derive from learning to read, for instance; or even though he were able to foresee all the advantages which he will obtain by skill in the art of reading through the course of life; yet is it the character of human nature, at every stage of life, to be so much influenced by present objects in preference to future views, that the sense of its utility alone would not be sufficient to induce him to apply to it. Even at the age of 12, of 20, of 50; nay, in extreme old age, when reason is become very perspicacious, and the passions are mortified; still we are unable to regulate our conduct solely by views of utility. Nothing could be more absurd, therefore, than to permit the child to spend his time in foolish tricks, or in idleness, till views of utility should prompt him to spend it in a different manner. No; let us begin early to habituate him to application and to the industrious exertion of his powers. By endowing him with powers of activity and apprehension, and rendering him capable of pursuing with a steady eye those objects which attract his desires, nature plainly points out to us in what manner we ought to cultivate his earlier years. Besides, we can command his obedience, we can awaken his curiosity, we can rouse his emulation, we can gain his affection, we can call forth his natural disposition to imitation, and we can influence his mind by the hope of reward and the fear of punishment. When we have so many means of establishing our authority over the mind of the boy without tyranny or usurpation; it cannot surely be difficult, if we are capable of any moderation and prudence, to cultivate his powers by making him begin at this period to give regular application to something that may afterwards be useful.

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And

Education.

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words and
of things
must be
learnt at the
same time.

And if the boy must now begin to dedicate some portion of his time regularly to a certain task, what task will be most suitable? Even that to which children are usually first required to apply; continue teaching him to read. Be not afraid that his abilities will suffer from an attention to books at so early an age. Say not that it is folly to teach him words before he have gained a knowledge of things. It is necessary, it is the design of nature, that he should be employed in acquiring a knowledge of things, and gaining an acquaintance with the vocal and written signs by which we denote them, at the same time. These are intimately connected; the one leads to the other. When you view any object, you attempt to give it a name, or seek to learn the name by which men have agreed to distinguish it: in the same manner, when the names of substances or of qualities are communicated to us, we are desirous of knowing what they signify. At the same time, so imperfect is the knowledge of nature which children can acquire from their own unassisted observation, that they must have frequent recourse to our assistance before they can form any distinct notions of those objects and scenes which they behold. Indeed language cannot be taught, without teaching that it is merely a system of signs, and explaining what each particular sign is designed to signify. If, therefore, language is not only necessary for facilitating the mutual intercourse of men, but is even useful for enabling us to obtain some knowledge of external nature, and if the knowledge of language has a natural tendency to advance our knowledge of things; to acquaint ourselves with it must therefore be regarded as an object of the highest importance: it must also be regarded as one of the first objects to which we ought to direct the attention of children. But the very same reasons which prove the propriety of making children acquainted with those artificial vocal signs which we use to express our ideas of things, prove also the propriety of teaching them those other signs by which we express these in writing. It is possible indeed, nay it frequently happens, that we attempt to instruct children in language in so improper a manner as to confound their notions of things, and to prevent their intellectual powers from making that improvement of which they are naturally capable: but it is also possible to initiate them in the art of reading, and in the knowledge of language, with better auspices and happier effects. The knowledge of language may be considered as the key by which we obtain access to all the stores of natural and moral knowledge.

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Confine-
ment, how
far proper

Though we now agree to confine our pupil to a certain task, and have determined that his first task shall be to learn to read; yet we do not mean to require that he be confined to this task during the greatest part of the day, or that his attention be seriously directed to no other object. To subject him to too severe restraint would produce the most unfavourable effects on his genius, his temper, and his dispositions. It is in consequence of the injudicious management of children, while they are sometimes suffered to run riot, and at other times cruelly confined like prisoners or slaves; it is in consequence of this, that we behold so many instances of peevishness, caprice, and invincible aversion to all serious application at this period of life. But were a due medium observed, were restraint duly tempered

with liberty and indulgence, nothing would be more easy than to dispose children to cheerful obedience, and to communicate to them instruction at this age. That part of their time which they are left to enjoy at liberty, they naturally dedicate to their little sports. The favourite sports of boys are generally active; those of girls, sedentary. Of each we may take advantage, to prepare them for the future employments of life. However, neither are the amusements of boys invariably active, nor those of girls always sedentary; for, as yet, the manners and dispositions of the two sexes are distinguished rather by habit or accident than by nature. The disposition to activity which characterizes children, is no less favourable to health than to their improvement in knowledge and prudence; their active sports have a tendency to promote their growth and add new vigour to their limbs. Perhaps, even at this time, children might be enticed to learn the elements of natural philosophy and natural history amid their amusements and sports. Birds, butterflies, dogs, and other animals, are now favourite objects of their care; their curiosity is powerfully roused by the appearance of any strange object; and many of the simplest experiments of natural philosophy are so pleasing, that they cannot fail to attract the attention even of those who are least under the influence of curiosity. Yet it would be improper to insist on their attention to these things as a task: if we can make them regard them as amusements, it will be well; if not, we must defer them to some happier season. They might also, by proper management, be led to acquire some skill in the arts. They build mimic houses, and fill them with suitable furniture; they construct little boats, and sail them; they will fence in little gardens, and cultivate them; and we even see them imitate all the labours of the husbandman. Such is the pleasure which man naturally feels in exerting his powers, and in acting with design. Let us encourage this disposition. These are the most suitable amusements in which they can engage.

As the boy's attention to literary objects is still supposed to be continued, he will soon be able to read with some correctness and facility. It becomes an object of importance, and of no small difficulty, to determine what books are to be put into his hands, and in what manner his literary education is to be conducted. After the child is made acquainted with the names and powers of the letters, with their combination into syllables, and with the combination of these again into words, so that he can read with tolerable facility; it will be proper that the pieces of reading which are put into his hands be such as are descriptive of the actions of men, of the scenes of external nature, and of the forms and characters of animals. With these he is already in some degree acquainted: these are the objects of his daily attention; beyond them the range of his ideas does not yet extend; and therefore other subjects will be likely to render his task disagreeable to him. Besides, our present object is to teach him words: in order to teach him words, we must let him know their signification; but till he have acquired a very considerable knowledge of language, till he have gained a rich fund of simple ideas, it will be impossible for him to read or to hear with understanding on any other subject but these. And let us not as yet be particularly

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Education. particularly anxious to communicate to him religious or moral instruction, otherwise than by our example, and by causing him to act in such a manner as we think most proper. Our great business at present is, to make him acquainted with our language, and to teach him in what manner we use it to express our ideas. By his own observation, and by our instruction, he will soon become capable of comprehending all that we wish to communicate: But let us not be too hasty; the boy cannot long view the actions of mankind, and observe the economy of the animal and the vegetable world, without becoming capable of receiving both religious and moral instruction when judiciously communicated.

54
Writing.

As soon as the pupil can read and spell with tolerable facility, and has acquired sufficient strength of arm and fingers to hold a pen, it may be proper to initiate him in the art of writing. If this art is not made disagreeable by the manner in which his application to it is required, he will learn it without difficulty. Childrens natural disposition to imitate, particularly whatever depends on manual operation, renders this art peculiarly easy and pleasing to them when they are not harshly forced to apply to it, nor suffered to get into a habit of performing their task with haste and negligence.

55
Restraint.

It requires indeed the most cautious prudence, the nicest delicacy, and the most artful address, to prevail with children to give a cheerful and attentive application to any appointed task. If you are too stern and rigid in enforcing application, you may seemingly obtain your object: the child sits motionless, and fixes his eye on his book or copy; but his attention you cannot command; his mind is beyond your reach, and can elude your tyranny; it wanders from the present objects, and flies with pleasure to those scenes and objects in which it has found delight. Thus you are disappointed of your purpose; and, besides, inspire the child with such aversion both to you and to those objects to which you wish him to apply, that perhaps at no future period will he view learning otherwise than with disgust.

56
Gentleness.

Again, gentleness, and the arts of insinuation, will not always be successful. If you permit the child to apply just when he pleases; if you listen readily to all his pretences and excuses; in short, if you seem to consider learning as a matter not of the highest importance, and treat him with kindness while he pays but little attention and makes but slow progress; the consequences of your behaving to him in this manner will be scarce less unfavourable than those which attend imprudent and unreasonable severity. It is, however, scarce possible to give particular directions how to treat children so as to allure them to learning, and at the same time to command their serious attention. But the prudent and affectionate parent and the judicious tutor will not be always unsuccessful; since there are so many circumstances in the condition of children, and so many principles in their nature, which subject them to our will.

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Arithmetic.

The principles of arithmetic ought to make a part in the boy's education as soon as his reasoning powers appear to have attained such strength and quickness that he will be able to comprehend them. Arithmetic affords more exercise to the reasoning powers of

the mind than any other of those branches of learning to which we apply in our earlier years: and if the child's attention be directed to it at a proper period, if he be allowed to proceed slowly, and if care be taken to make him comprehend fully the principles upon which each particular operation proceeds, it will contribute much to increase the strength and the acuteness of the powers of his understanding.

Where the learned languages are regarded as an object worthy of attention, the boy is generally initiated in them about this time, or perhaps earlier. We have reserved to a separate head the arguments which occur to us for and against the practice of instructing children in the dead languages; and shall therefore only observe in this place, that the study of them ought not to engross the learner's attention so entirely as to exclude other parts of education.

From arithmetic our pupil may proceed to the practical branches of the mathematics: And in all of these, as well as in every other branch of learning, what you teach him will be best remembered and most thoroughly understood, if you afford him a few opportunities of applying his lessons to real use in life. Geometry and geography are two most important branches of education; but are often taught in such a manner, that no real benefit is derived from the knowledge of them. The means which Rousseau proposes for initiating young people in these and in several other of the arts and sciences are excellent; and if judiciously applied, could hardly fail of success.

While boys are engaged in these and in the languages, they may also attend to and cultivate the bodily exercises; such as dancing, fencing, and horsemanship. Each of these exercises is almost absolutely necessary for one who is designed to have intercourse with the world; and besides, they have a tendency to render the powers of the body active and vigorous, and even to add new courage and firmness to the mind.

When our pupil has acquired some knowledge of his own and of the learned languages, has gained some skill in the principles of arithmetic and of practical mathematics, and has received some instruction in the principles of morality and religion, or even before this time, it will be proper to begin him to the practice of composition. Themes, versions, and letters, the first exercises in composition which the boy is usually required to perform, none of them seems happily calculated for leading him to increase his knowledge, or to acquire the power of expressing himself with ease and elegance. Without enlarging on the impropriety or absurdity of these exercises, we will venture to propose something different, which we cannot help thinking would conduce more effectually to the end in view. It has been already observed, that the curiosity of children is amazingly eager and active, and that every new object powerfully attracts their regard: but they cannot view any object without taking notice of its most obvious qualities; any animal, for instance, without taking notice of its shape, its colour, its seeming mildness or ferocity; and they are generally pretty ready to give an account of any thing extraordinary which they have observed. How easy then would it be to require them to write down an account of any new object exposed to their observation?

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Practical.
mathematics.

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First exercises in composition.

Education. tion? The task would not be difficult; and every new piece of composition which they presented to us would add so much to their knowledge of nature. We might even require such specimens of their accuracy of observation and skill in language, at times when they enjoyed no opportunities of beholding new or surprising objects; a tree, a flower, a field, a house, an animal, any other simple object, should be the subject of their exercise. After some time, we might require them to describe something more various and complex. They might give an account of several objects placed in a relative situation; as, a stream, and the vale through which it flows; or, a bird, and the manner in which it constructs its nest; or, of one object successively assuming various appearances, as the bud, the flower, the apple. Human actions are daily exposed to their observation, and powerfully attract their attention. By and by, therefore, their task should be to describe some action which had lately passed in their presence. We need not pursue this hint farther; but, if we mistake not, by these means young people might sooner, and much more certainly, be taught to express themselves with ease and correctness in writing, than by any of the exercises which they are at present caused to perform with a view to that. Besides, they would at the same time acquire much more real knowledge. The study of words would then be rendered truly subservient to their acquiring a knowledge of things.

We cannot descend to every particular of that series of education in which we wish the boy to be engaged from that period when he first becomes capable of serious application till he reach the age of puberty. It is not necessary that we should, after having given abstracts of what has been offered to the world by so many respectable writers on the subject.

The few hints which we have thrown out will be sufficient to show, in general, in what manner we wish the youth's education to be conducted during this period. Let the parent and the tutor bear in mind, that much depends on their example, with regard to the dispositions and manners of the youth; and let them carefully strive to form him to gentleness, to firmness, to patient industry, and to vigorous courage: let them, if possible, keep him at a distance from that contagion with which the evil example of worthless servants and play-fellows will be likely to infect him. Now is the time for sowing the seeds of piety and virtue: if carefully sown now, they will scarce fail to grow up, and bear fruit in future life.

III. *From Puberty to Manhood.*

THIS age is every way a very important period in human life. Whether we consider the change which now takes place in the bodily constitution, or the passion which now first begins to agitate the breast, still we must regard this as a critical season to the youth. The business of those to whose care he is still entrusted, is to watch over him so as to prevent the passion for the sex from hurrying him to shameful and vicious indulgence, and from seducing him to habits of frivolity and indolence; to prevent him from becoming either the shameless rake, or the trifling coxcomb. Though so furious is the impulse of that appetite which now fires the bosom and shoots through the veins of the youth, that to restrain him from the

excesses to which it leads can be no easy task; yet if his education has been hitherto conducted with prudence, if he is fond of manly exercises, active, sober, and temperate, and still influenced by modesty and the sense of shame; even this may through the blessing of heaven be accomplished. It is impossible to give better directions than those of Rousseau for this purpose. Let the young man know his situation; set before him in a striking light the virtue which he may practise by restraining appetite, and the frightful fatal vices into which he may be hurried. But trust not to precept, nor to any views which you can lay before him, either of the disgracefulness and the pernicious consequences of vice, or of the dignity and the happy fruits of virtue. Something more must be done. Watch over him with the attention of an Argus; engage him in the most active and fatiguing sports. Carefully keep him at a distance from all such company, and such books, as may suggest to his mind ideas of love, and of the gratification at which it aims. But still all your precautions will not counteract the designs of nature; nor do you wish to oppose her designs. The youth under your care must feel the impulse of desire, and become susceptible of love. Let him then fix his affections on some virtuous young woman. His attachment to her will raise him above debauchery, and teach him to despise brutal pleasures: it will operate as a motive to dispose him to apply to such arts, and to pursue such branches of knowledge, as may be necessary for his farther establishment in the world. The good sense of Rousseau on this head renders it less necessary for us to enlarge on it; especially as we are to treat of some articles separately which regard the management of youth at this period.

IV. *Religion and Morals.*

IN pointing out the general plan of education which appears to us the most proper to be pursued in order to form a virtuous and respectable member of society, we took but slight notice of the important objects of religion and morals. At what period, and in what manner, ought the principles of religion and morality to be instilled into the youthful mind? It has been before observed, that children are capable of reasoning and of moral distinctions even at a very early age. But they cannot then comprehend our reasonings, nor enter into our moral distinctions; because they are strangers to our language, and to the artificial manner in which we arrange our ideas when we express them in conversation or in writing. It follows, then, that as soon as they are sufficiently acquainted with our language, it must be proper to communicate to them the principles and precepts of morality and religion. Long before this time, they are diligent and accurate observers of human actions. For a short period it is merely the external act which they attend to and observe: soon, however, they penetrate farther; conscious themselves of reflection and volition, they regard us also as thinking beings; conscious of benevolent and of unfriendly dispositions, they regard us as acting with design, and as influenced by passion: naturally imitative animals, they are disposed in their conduct to follow the example which we set before them. By our example we may teach them piety and virtue long before it can be proper to offer them religious or moral instruction in a formal manner.

Education.

We cannot presume to determine at what particular period children ought to be first informed of their relations to God and to society, and of the duties incumbent on them in consequence of those relations. That period will be different to different children, according to the pains which have been taken, and the means which have been employed, in cultivating their natural powers. Perhaps even where the most judicious maxims of education have been adopted, and have been pursued with the happiest effects, it cannot be sooner than the age of eight or nine. But even before this period much may be done. Show the child your reverence for religion and virtue; talk in his presence, and in the plainest, simplest terms, though not directly to him, of the existence of God the creator, the preserver, and the governor of the world; speak of the constant dependance of every creature on the gracious care of that Being; mention with ardour the gratitude and obedience which we owe to him as our great parent and best benefactor; next, speak of the mutual relations of society; of the duties of children and parents, of masters and servants, of man to man. At length, when his mind is prepared by such discourses which have passed in his presence without being addressed to him, you may begin to explain to him in a direct manner the leading doctrines of religion. He will now be able to comprehend you, when you address him on that important subject: the truths which you communicate will make a powerful impression on his mind; an impression which neither the corruption and dissipation of the world, nor the force of appetite and passion, will ever be able to efface.

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Habit.

Some writers on this subject have asserted, that youth are incapable of any just ideas of religion till they attain a much more advanced age; and have insisted, that, for this reason, no attempts should be made to communicate to them the articles of our creed in their earlier years. This doctrine, both from its novelty and from its pernicious tendency, has provoked the keenest opposition. It has, however, been opposed rather with keenness than with acuteness or skill. Its opponents seem to have generally allowed that children are incapable of reasoning and of moral distinctions; but they have ascribed wonderful effects to habit. Enrich the memories of children, say they, with the maxims of morality, and with the doctrines of religion; teach them prayers, and call them to engage in all the ordinances of religion. What though they comprehend not the meaning of what they learn? What though they understand not for what purpose you bid them repeat their prayers, nor why you confine them on the Lord's day from their ordinary amusements? Their powers will at length ripen, and they will then see in what they have been employed, and derive the highest advantage from the irksome tasks to which you confined them. You have formed them to habits which they will not be able to lay aside: After this they cannot but be religious at some period of life, even though you have inspired them with a disgust for the exercises of religion. Those good people have also talked of the principle of *the association of ideas*. As no man stands alone in society, say they; so no one idea exists in the mind single and unconnected with others: as you are connected with your parents, your children, your friends, your coun-

trymen; so the idea of a tree, for instance, is connected with that of the field in which it grows, of the fruit which it bears, and of contiguous, dissimilar, and resembling objects. When any one set of related ideas have been often presented to the mind in connection with one another, the mind at length comes to view them as so intimately united, that any particular one among them never fails to introduce the rest. Revisit the scenes in which you spent your earliest years; the sports and companions of your youth naturally arise to your recollection. Have you applied to the study of the classics with reluctance and constraint, and suffered much from the severity of parents and tutors for your indifference to Greek and Latin? you will, perhaps, never through the course of life see a grammar school, without recollecting your sufferings, nor look on a Virgil or Homer without remembering the stripes and confinement which they once occasioned to you. In the same manner, when religious principles are impressed on the mind in infancy in a proper manner, an happy association is formed which cannot fail to give them a powerful influence on the sentiments and conduct in future life. But if we have advanced to manhood before being informed of the existence of a Deity, and of our relation to him; the principles of religion, when communicated, no longer produce the same happy effects: the heart and the understanding are no longer in the same state; nor will the same associations be formed.

This doctrine of *the association of ideas* has been ad-
duced by an ingenious writer, distinguished for his
discoveries in natural philosophy, and for his labours
in controversial divinity, as an argument in behalf of the
propriety of instructing youth in the principles of re-
ligion even in their earliest years. We admire, we
esteem, the spirit which has prompted him to discover
so much concern for the interests of the rising genera-
tion; but at the same time we will not conceal our
opinion, that even this argument ought to be urged
with caution. Many of the phenomena of human na-
ture may indeed be explained, if we have recourse to
the principle of *association*. The influence of any
principle, religious or moral, depends in a great mea-
sure on the ideas and images which, in considering it,
we have been accustomed to associate with it in our
minds. But what are the ideas or images most likely
to be associated by children with the doctrines and du-
ties of religion, if we call them to listen to the one
and perform the other at too early a period? Will
they be such as may assist the influence of religion on
their sentiments and conduct in the future part of
life? Observe the world: Are those who, in infancy,
have been most rigidly compelled to get their cate-
chisms by rote, either the most pious or the best in-
formed in religious matters? Indeed, when we consi-
der what has been said of the influence of habit, and
of the association of ideas, we cannot help thinking,
that any arguments which on the present occasion
may be adduced from either of these, tend directly to
prove, not that we ought to pour in religious instruc-
tion into the minds of children, without considering
whether they be qualified to receive it; but, on the
contrary, that we ought cautiously to wait for and
catch the proper season;—that season when the youth-
ful mind, no longer a stranger to our language, our
sentiments,

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Dr Priest-
ley's opi-
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sociation of
ideas.

Education. sentiments, our views of nature, or our manner of reasoning, will be able to go along with us, when we talk to him of a supreme Being, of our condition as dependant and accountable creatures, of truth, benevolence, and justice.

We flatter ourselves, then, that our readers will readily agree with us, 1st, That the moral and reasoning powers of children begin to display themselves at a very early age, even in infancy. 2dly, That as soon as they have made themselves acquainted with the most obvious appearances of nature, and have gained a tolerable knowledge of our language and our manner of arranging our ideas in reasoning, we may with the greatest propriety begin to instruct them in the principles of religion. 3dly, That the most careful and judicious observation is necessary to enable us to distinguish the period at which children become capable of receiving religious instruction; because, if we either attempt to communicate to them these important truths too early, or defer them till towards manhood, we may fail of accomplishing the great end which we have in view.

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Cate-
chisms.

If we can be so fortunate as to choose the happiest season for sowing the first seeds of piety in the infant mind, our next care will be to sow them in a proper manner. We must anxiously endeavour to communicate the principles of religion and morality, so as they may be easiest comprehended by the understanding of the learner, and may make the deepest impression on his heart. It would be a matter of the greatest difficulty to give particular directions on this head. The discretion of the parent or tutor must here be his guide. We are afraid that some of the catechisms commonly taught are not very happily calculated to serve the purpose for which they are intended. Yet we do not wish that they should be neglected while nothing more proper is introduced in their room. In instructing children in the first principles of religion, we must beware of arraying piety in the gloomy garb, or painting her with the forbidding features, in which she has been represented by anchorites, monks, and puritans. No; let her assume a pleasing form, a cheerful dress, and an inviting manner. Describe the Deity as the affectionate parent, the benefactor, and though the impartial yet the merciful judge of mankind. Exhibit to them Jesus Christ, the generous friend and saviour of the posterity of Adam, who with such enchanting benevolence hath said, "Suffer little children to come unto me." Represent to them his yoke as easy, and his burden as light. Insist not on their saying long prayers or hearing tedious sermons. If possible, make the doctrines of religion to appear to them as glad tidings, and its duties as the most delightful of tasks.

V. *The Languages.*

Is the time usually spent in learning the languages usefully occupied? What advantages can our British youth derive from an acquaintance with the languages and the learning of Greece and Rome? Would we listen to many of the fathers, the mothers, and the polite tutors of the present age, they will persuade us, that the time which is dedicated to grammar-schools, and to Virgil, Cicero, Homer, and Demosthenes, is foolishly thrown away; and that

no advantages can be gained from the study of classical learning. They wish their children and pupils to be not merely scholars; they wish them to acquire what may be useful and ornamental when they come to mingle with the world; and for this purpose, they think it much better to teach their young people to smatter a little out French, to dance, to fence, to appear in company with invincible assurance, and to dress in such a manner as may attract the attention of the ladies. Besides, the tenderness and humanity of those people are amazing. They are shocked at the idea of the sufferings which boys undergo in the course of a classical education. The confinement, the stripes, the harsh language, the burdens laid on the memory, and the pain occasioned to the eyes, during the dreary period spent in acquiring a knowledge of Greek and Latin, affect them with horror when they think of them as inflicted on children. They therefore give the preference to a plan of education in which less intense application is required and less severity employed.

But, again, there are others who are no less warm in their eulogiums on a classical education, and no less industrious in recommending the study of Greek and Latin, than those are eager in their endeavours to draw neglect on the polished languages of antiquity. With this second class, if an adept in Greek and Latin, you are a great and learned man; but without those languages, contemptible for ignorance. They think it impossible to inspire the youthful mind with generous or virtuous sentiments, to teach the boy wisdom, or to animate him with courage, without the assistance of the ancient philosophers, historians, and poets. Indeed their superstitious reverence for the ancient languages, and for those writers whose compositions have rendered Greece and Rome so illustrious, leads them to ascribe many other still more wonderful virtues to a classical education.

With which of these parties shall we join? or shall we mediate between them? Is it improper to call youth to the study of the languages? Is it impossible to communicate any useful knowledge without them? Or are they, though highly useful, yet not always indispensably necessary?

We have formerly taken notice of one circumstance in favour of a classical education, to which it may be proper to recal the attention of our readers. We observed, that the cultivation of classical learning has a favourable influence on the living languages. It has a tendency to preserve their purity from being debased, and their analogy from becoming irregular. In studying the dead languages, we find it necessary to pay more attention to the principles of grammar than in acquiring our mother-tongue. We learn our native language without attending much to its analogy and structure. Of the numbers who speak English through the British dominions, but few are skilled in the inflexion of its nouns and verbs, or able to distinguish between adverbs and conjunctions. Desirous only of making their meaning understood, they are not anxious about purity or correctness of speech. They reject not an expression which occurs to them, because it is barbarous or ungrammatical. As they grew up they learned to speak from their mothers, their nurses, and others about them: they were soon able to make known their wants, their wishes, and their observations,

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Prejudices
against clas-
sical educa-
tion.

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Prejudices
for it.

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Utility of
classical
learning to-
wards the
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ment of
our mother
tongue.

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tions, in words. Satisfied with this, or called at a very early period to a life of humble industry, they have continued to express themselves in their mother-tongue without acquiring any accurate knowledge of its general principles. If these people find occasion to express themselves in writing, they are scarce more studious of correctness and elegance in writing than in speaking; or, though they may aspire after those properties, yet they can never attain them. But such writers or speakers can never refine any language, or reduce it to a regular analogy. Neither can they be expected to distinguish themselves as the guardians of the purity and regularity of their native tongue, if it should before have attained an high degree of perfection. But they who, in learning a language different from their native tongue, have found it necessary to pay particular attention to the principles of grammar, afterwards apply the knowledge of grammar which they have thus acquired in using their mother-tongue; and by that means become better acquainted with its structure, and learn to write and speak it with more correctness and propriety. Besides, the languages of Greece and Rome are so highly distinguished for their copiousness, their regular analogy, and for various other excellencies, which render them superior to even the chief of modern languages, that the study of them has a natural tendency to improve and enrich modern languages. If we look backwards to the 15th century, when learning began to revive in Europe, and that species of learning which began first to be cultivated was classical literature, we find that almost all the languages then spoken in Europe were wretchedly poor and barbarous. Knowledge could not be communicated, nor business transacted, without calling in the aid of Latin. Classical learning, however, soon came to be cultivated by all ranks with enthusiastic eagerness. Not only those designed to pursue a learned profession, and men of fortune whose object was a liberal education without a view to any particular profession; but even the lower ranks, and the female sex, keenly studied the languages and the wisdom of Greece and Rome. This avidity for classical learning was followed by many happy effects. But its influence was chiefly remarkable in producing an amazing change on the form of the living languages. These soon became more copious and regular; and many of them have consequently attained such perfection, that the poet, the historian, and the philosopher, can clothe their thoughts in them to the greatest advantage. Could we derive no new advantage from the study of the ancient languages, yet would they be worthy of our care, as having contributed so much to raise the modern languages to their present improved state. But they can also conduce to the preservation and support of those noble structures which have been reared by their assistance. The intercourse of nations, the affectation of writers, the gradual introduction of provincial barbarisms, and various other causes, have a tendency to corrupt and debase even the noblest languages. By such means were the languages of Greece and Rome gradually corrupted, till the language used by a Horace, a Livy, a Xenophon, and a Menander, was lost in a jargon unfit for the purposes of composition. But if we would not disdain to take advantage of them, the classical works in those languages might

prevent that which we use from experiencing such a decline. He who knows and admires the excellencies of the ancient languages, and the beauties of those writers who have rendered them so celebrated, will be the firm enemy of barbarism, affectation, and negligence, whenever they attempt to debase his mother-tongue. We venture therefore to assert, that when the polished languages of antiquity cease to be studied among us, our native tongue will then lose its purity, regularity, and other excellencies, and gradually decline till it be no longer known for the language of Pope and of Addison; and we adduce it as an argument in behalf of classical learning, that it has contributed so much to the improvement of the living languages, and is almost the only means that can prevent them from being corrupted and debased.

In those plans of education of which the study of the dead languages does not make a part, proper means are seldom adopted for impressing the youthful mind with habits of industry: nor do the judgment, the memory, and the other powers of the mind, receive equal improvement, as they pass not through the same exercises as in a classical education. Let us enter those academies where the way to a complete education leads not through the thorny and rugged paths of classical literature; let us attend to the exercises which the polite teachers cause their pupils to perform. Do they insist on laborious industry or intense application? No; they can communicate knowledge without requiring laborious study. They profess to allow their pupils to enjoy the sweets of idleness, and yet render them prodigies of learning. But are their magnificent promises ever fulfilled? Do they indeed cultivate the understandings of the young people intrusted to their care? They do not: their care is never once directed to this important object. To adorn them with showy and superficial qualities, is all that those gentlemen aim at. Hence, when their pupils come to enter the world and engage in the duties of active life, they appear destitute of every manly qualification. Though they have attained the age and grown up to the size of manhood, their understandings are still childish and feeble: they are capricious, unsteady, incapable of industry or fortitude, and unable to pursue any particular object with keen, unremitting perseverance. That long series of study and regular application, which is requisite in order to attain skill in the ancient languages, produces much happier effects on the youthful mind. The power of habit is universally felt and acknowledged. As he who is permitted to trifle away the earliest part of his life in idleness or in frivolous occupations, can scarce be expected to display any manly or vigorous qualities when he reaches a more mature age; so, on the contrary, he whose earlier days have been employed in exercising his memory and furnishing it with valuable treasures, in cultivating his judgment and reasoning powers by calling the one to make frequent distinctions between various objects, and the other to deduce many inferences from the comparison of the various objects presented to the understanding, and also in strengthening and improving the acuteness of his moral powers by attending to human actions and characters, and distinguishing between them, as virtuous or vicious, as mean or glorious: he who has thus cultivated his powers, may be naturally

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For inuring
to industry.

Education. expected to distinguish himself when he comes to perform his part in active life, by prudence, activity, firmness, perseverance, and most of the other noble qualities which can adorn a human character. But in the course of a classical education, the powers of the mind receive this cultivation; and therefore these happy effects may be expected to follow from it. The repetitions which are required afford improving exercise to the memory, and store it with the most valuable treasures: the powers of the understanding are employed in observing the distinctions between words; in tracing words to the substances and qualities in nature which they are used to represent; in comparing the words and idioms of different languages, and in tracing the laws of their analogy and construction; while our moral faculties are at the same time improved, by attending to the characters which are described, and the events and actions which are related, in those books which we are directed to peruse in order to acquire the ancient languages. We assert therefore, that the study of the ancient languages is particularly useful for improving and strengthening all the powers of the mind; and, by that means, for preparing us to act our part in life in a becoming manner: and this our readers will readily agree with us in considering as a weighty argument in behalf of that plan of education.

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Fund of
useful and
elegant
knowledge
which an-
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thors af-
ford.

But if, after all, classical learning is still to be given up, where shall we find the same treasures of moral wisdom, of elegance, and of useful historical knowledge, which the celebrated writers of Greece and Rome afford? Will you content yourself with the modern writers of Italy, France, and England? Or will you deign to survey the beauties of Homer and Virgil through the medium of a translation? No surely; let us penetrate to those sources from which the modern writers have derived most of the excellencies which recommend them to our notice; let us disdain to be imposed upon by the whims or the ignorance of a translator.

Juvat integros accedere fontes.

Farther, classical learning has long been cultivated among us; and both by the stores of knowledge which it has conveyed to the mind, and the habits which it has impressed, has contributed in no small degree to form many illustrious characters. In reviewing the annals of our country, we will scarce find an eminent politician, patriot, general, or philosopher, during the two last centuries, who did not spend his earlier years in the study of the classics.

Yet though we have mentioned these things in favour of classical literature, and were we to descend to minute particulars might enumerate many more facts and circumstances to recommend it; we mean not to argue that it is absolutely impossible to be a wise, a great, or a good man, unless you are skilled in Greek and Latin. Means may, no doubt, be adopted to inspire the young mind with virtuous dispositions, to call forth the powers of the youthful understanding, and to impress habits of industry and vigorous perseverance, without having recourse to the discipline of a grammar school. But we cannot help thinking, for the reasons which we have stated to our readers, that a classical education is the most likely to produce these happy effects.

As we are afterwards to take particular notice of
N^o 109.

the course of education most suitable for those who are to occupy the humble stations in society, we shall not here inquire whether it be proper to introduce them to an acquaintance with the Greek and Latin classics.

VI. On the Education of People of Rank and Fortune.

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Those whom the kindness of Providence has placed in an elevated station, and in affluent circumstances, so that they seem to be born rather to the enjoyment of wealth and honours than to act in any particular profession or employment, have notwithstanding a certain part assigned them to perform, and many important duties to fulfil. They are members of society, and enjoy the protection of the civil institutions of that society to which they belong; they must therefore contribute what they can to the support of those institutions. The labours of the industrious poor are necessary to supply them with the luxuries of life; and they must know how to distribute their wealth with prudence and generosity among the poor. They enjoy much leisure; and they ought to know how to employ their leisure hours in an innocent and agreeable manner. Besides, as their circumstances enable them to attract the regard and respect of those who are placed in inferior stations, and as the poor are ever ready to imitate the conduct of their superiors; it is necessary that they endeavour to adorn their wealth and honours by the most eminent virtues, in order that their example may have an happy influence on the manners of the community.

There education ought therefore to be conducted with a view to these ends. After what we have urged in favour of a classical education, our readers will naturally presume that we regard it as highly proper for a man of fortune. The youth who is destined to the enjoyment of wealth and honours, cannot spend his earlier years more advantageously than in gaining an acquaintance with the elegant remains of antiquity. The benefits to be derived from classical learning are peculiarly necessary to him. Care must be taken to preserve him from acquiring an haughty, fierce, imperious temper. The attention usually paid to the children of people of fortune, and the foolish fondness with which they are too often treated, have a direct tendency to inspire them with high notions of their own importance, and to render them passionate, overbearing, and conceited. But if their temper acquire this bias even in childhood, what may be expected when they advance towards manhood, when their attention is likely to be oftener turned to the dignity and importance of that rank which they occupy, and to the pitiful humility of those beneath them? Why, they are likely to be so proud, insolent, resentful, and revengeful, as to render themselves disagreeable and hateful to all who know them; and besides, to be incapable of those delightful feelings which attend humane, benevolent, and mild dispositions. Let the man of fortune, therefore, as he is concerned for the future happiness and dignity of his child, be no less careful to prevent him from being treated in such a manner as to be inspired with haughtiness, caprice, and insolence, than to prevent his mind from being soured by harsh and tyrannical usage.

The manly exercises, as they are favourable to the health, the strength, and even the morals; so they are highly

Duties of
people of
rank.

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How to
form the
temper of
a young
man of for-
tune.

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highly worthy of engaging the attention of the young gentleman. Dancing, fencing, running, horsemanship, the management of the musket, and the motions of military discipline, are none of them unworthy of occupying his time, at proper seasons. It is unnecessary to point out the advantages which he may derive from dancing; these seem to be pretty generally understood. Perhaps our men of fortune would be ashamed to make use of their legs for running; but occasions may occur, on which even this humble accomplishment may be useful. Though we wish not to see the young man of fortune become a jockey; yet to be able to make a graceful appearance on horseback, and to manage his horse with dexterity, will not be unworthy of his station and character. If times of public danger should arise, and the state should call for the services of her subjects against any hostile attack, they whose rank and fortune place them in the most eminent stations will be first expected to stand forth; but if unacquainted with those exercises which are connected with the military art, what a pitiful figure must they make in the camp, or on the field of battle?

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Law.

As the man of fortune may perhaps enjoy by hereditary right, or may be called by the voice of his fellow-citizens, to a seat among the legislative body of his country; he ought in his youth to be carefully instructed in the principles of her political constitution, and of those laws by which his own rights and the rights of his fellow-citizens are determined and secured.

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Philosophy.

Natural philosophy, as being both highly useful and entertaining, is well worthy of the attention of all who can afford to appropriate any part of their time to scientific pursuits; to the man of fortune, a taste for natural philosophy might often procure the most delightful entertainment. To trace the wonders of the planetary systems, to mark the process of vegetation, to examine all the properties of that fine element which we breathe, to trace the laws by which all the different elements are confined to their proper functions, and above all to apply the principles of natural philosophy in the cultivation of the ground, are amusements which might agreeably and innocently occupy many of the leisure hours of the man who enjoys a splendid and independent fortune.

73
History and
morals.

Neither do we suppose civil history and the principles of morals to be overlooked. Without being acquainted with these, how could any just or accurate knowledge of the laws and political constitution of his country be acquired by the young gentleman? History exposes to our observation the fortune and the actions of other human beings, and thus supplies in some measure the place of experience; it teaches prudence, and affords exercise to the moral sense. When history condescends to take notice of individuals, they are almost always such as have been eminent for virtue, for abilities, or for the rank which they held in life; to the rich and great it ought to speak with peculiar efficacy, and they ought to be carefully invited to listen to its voice.

Such then is the manner in which we wish the education of young men of rank and fortune to be conducted, in order that they may be prepared for enjoying their opulence and honours with becoming dignity. Let them be early inured to habits of vigorous

industry and persevering firmness, by passing through a regular course of classical learning in a free school; let them play and converse with their equals, and not be permitted to form high ideas of their own importance, nor to domineer over servants or inferiors: Let them be carefully instructed in the principles of morality and religion: Let them be taught the manly exercises: Let them be carefully informed of the nature of the political constitution of their country, and of the extent of those civil and political rights which it secures to them and their fellow-citizens: Let them be called to trace the annals of mankind through the records of history; to mark the appearances and operations of nature, and to amuse themselves by pursuing these to their general causes. We say nothing of causing the young man of fortune to learn some mechanical art: We think skill in a mechanical art might now and then afford him an innocent and pleasing amusement; but we do not consider it as absolutely necessary, and therefore do not insist on his acquiring it. With those accomplishments we hope he might become an useful member of society, might adorn the rank and fortune to which he is born, and might find wealth and high station a blessing, not a curse. It is peculiarly unfortunate for our age and country, that people of rank and fortune are not so studious that their children acquire these as the more superficial accomplishments.

VII. *On the Education of People designed for a Mercantile Employment, and for the humbler Occupations in Life not particularly connected with Literature.*

WERE modern literature in a less flourishing state; were the English and French languages adorned with fewer eminent poetical, historical, and philosophical compositions; we might perhaps insist on it as necessary to give the boy, who is designed for a mercantile employment, a classical education. At present this does not appear absolutely necessary; yet we do not presume to forbid it as improper. Even the merchant will scarce find reason to repent his having been introduced to the acquaintance of Plato and Cicero. But still, if the circumstances of the parent, or any other just reason, should render it inconvenient to send the young man who is intended for trade to a free school to study the ancient languages, means may be easily adopted to make up for his loss. Confine him not to writing and accounts alone. These, though particularly useful to the merchant, have no great power to restrain the force of evil passions, or to inspire the mind with generous and virtuous sentiments. Though you burden him not with Latin and Greek, yet strive to inspire him with a taste for useful knowledge and for elegant literature. Some of the purest and most elegant of our poets, the excellent periodical works which have appeared in our language, such as the Spectator, the Adventurer, the Mirror, and the compositions of our British historians, together with some of the best translations of the classics which we possess; these you may with great propriety put into his hands. They will teach him how to think and reason justly, and to express himself in conversation or in writing with correctness and elegance: they will refine and polish his mind, and raise him above low and gross pleasures. And as no man, who has any occasion to speak or write, ought to be entirely ignorant of the principles of grammar, you will

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Elegant literature.

Y y

therefore

Education. therefore be careful to instruct the young man who is designed for a mercantile occupation in the grammar of his mother-tongue.

75
Integrity.

A sacred regard to his engagements, and an honesty which may prevent him from taking undue advantages or exacting unreasonable profits, are the virtues which a merchant is most frequently called to exercise: punctuality and integrity are the duties most particularly incumbent on the mercantile profession. Temptations will now and then arise to seduce the merchant to the violation of these. But if superior to every such temptation, he is one of the most illustrious characters, and is likely to be one of the most successful merchants. From his earliest years, then, labour to inspire the child whom you intend for trade with a sacred regard for truth and justice: let him be taught to view deceit and fraud, and the violation of a promise, with abhorrence and disdain. Frugality is a virtue which, in the present age, seems to be antiquated or proscribed. Even the merchant often appears better skilled in the arts of profusion than in those of parsimony. The miser, a character at no time viewed as amiable, is at present beheld with double detestation and contempt. Yet, notwithstanding these unfavourable circumstances, fear not to impress on the young merchant habits of frugality. Let him know the folly of beginning to spend a fortune before he have acquired it. Let him be taught to regard a regular attention to confine his expences within due bounds, as one of the first virtues which can adorn his character.

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Industry.

Frugality and industry are so closely connected, that when we recommend the one of them to the merchant, we will be naturally understood to recommend the other also. It is easy to see, that, without industrious application, no man can reasonably expect to meet with success in the occupation in which he engages: and if the merchant thinks proper to leave his business to the management of clerks and shop-keepers, it is not very probable that he will quickly accumulate a fortune. It is, therefore, no less necessary, that he who is intended for trade be early accustomed to habits of sober application, and be carefully restrained from volatility and levity, than that he be instructed in writing, arithmetic, and keeping of accounts.

With these virtues and qualifications the merchant is likely to be respectable, and not unsuccessful, while he continues to prosecute his trade; and if, by the blessing of Providence, he be at length enabled to accumulate a moderate fortune, his acquaintance with elegant literature, and the virtuous habits which he has acquired, will enable him to enjoy it with taste and dignity. Indeed, all the advantages which a man without taste, or knowledge, or virtue, can derive from the possession of even the most splendid fortune, are so inconsiderable, that they can be no adequate reward for the toil which he undergoes, and the mean arts which he practises in acquiring it. At the head of a great fortune a fool can only make himself more ridiculous, and a man of a wicked and vicious character more generally abhorred, than if fortune had kindly concealed their crimes and follies by placing them in a more obscure station.

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Education of persons in the lowest ranks.

A considerable part of the members of society are placed in such circumstances, that it is impossible for them to receive the advantages of a liberal education. The mechanic and the husbandman, who earn a subsist-

ence by their daily labour, can seldom afford, whatever Education parental fondness may suggest, to favour their children with many opportunities of literary instruction. Content if they can provide them with food and raiment till such time as they acquire sufficient strength to labour for their own support, parents in those humble circumstances seldom think it necessary that they should concern themselves about giving their children learning. Happily it is not requisite that those who are destined to spend their days in this low sphere should be furnished with much literary or scientific knowledge. They may be taught to read their mother tongue, to write, and to perform some of the most common and the most generally useful operations of arithmetic: for without an acquaintance with the art of reading, it will scarce be possible for them to acquire any rational knowledge of the doctrines and precepts of religion, or of the duties of morality; the invaluable volume of the sacred scriptures would be sealed to them: we may allow them to write, in order that they may be enabled to enjoy the sweet satisfaction of communicating accounts of their welfare to their absent friends; and, besides, both writing and arithmetic are necessary for the accomplishment of those little transactions which pass among them. It would be hard, if even the lowest and poorest were denied these simple and easily acquired branches of education; and happily that degree of skill in them which is necessary for the labourer and the mechanic may be attained without greater expence than may be afforded by parents in the meanest circumstances. Let the youth who is born to pass his days in this humble station be carefully taught to consider honest patient industry as one of the first of virtues: let him be taught to regard the sluggard as one of the most contemptible of characters: teach him contentment with his lot, by letting him know that wealth and honour seldom confer superior happiness: Yet scruple not to inform him, that if he can raise himself above the humble condition to which he was born, by honest arts, by abilities virtuously exerted, he may find some comfort in affluent circumstances, and may find reason to rejoice that he has been virtuous, industrious, and active. In teaching him the principles of religion, be careful to show him religion as intimately connected with morality: teach him none of those mysterious doctrines, whose sole tendency is to foster that enthusiasm which naturally prevails among the vulgar, and to persuade them that they may be pious without being virtuous. Labour to inspire him with an invincible abhorrence for lying, fraud, and theft. Inspire him with an high esteem for chastity, and with an awful regard to the duties of a son, an husband, and a father. Thus may he become respectable and happy, even in his humble station and indigent circumstances; a character infinitely superior, in the eyes of both God and man, to the rich and great man who misemploys his wealth and leisure in shameful and vicious pursuits.

VIII. On the Education of the Female Sex.

THE abstracts which we have given of some of the most celebrated and original treatises on education, as well as our own observations on this subject, have been hitherto either relative to the education of both the sexes, or directed chiefly to the education of the male sex. But as there is a natural difference between the charac-

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ters of the two sexes, and as there are certain duties peculiar to each of them; it is easy to see that the education of the boy and that of the girl cannot, ought not, to be conducted precisely in the same manner. And since the duties of the female sex are so important to society, and they form so considerable a part of our species; their education, therefore, merits the highest attention.

In infancy, the instincts, the dispositions, and the faculties of boys and girls seem to be nearly the same. They discover the same curiosity, and the same disposition to activity. For a while they are fond of the same sports and amusements. But by and by, when we begin to make a distinction in their dress; when the girl begins to be more confined to a sedentary life under her mother's eye, while the boys are permitted to ramble about without doors; the distinction between their characters begins to be formed, and their taste and manners begin to become different. The boy now imitates the arts and the active amusements of his father; digs and plants a little garden, builds a house in miniature, shoots his bow, or draws his little cart; while the girl, with no less emulation, imitates her mother, knits, sews, and dresses her doll. They are no longer merely children: the one is now a girl; the other a boy. This taste for female arts, which the girl so easily and naturally acquires, has been judiciously taken notice of by Rousseau, as affording an happy opportunity for instructing her in a very considerable part of those arts which it is proper to teach her. While the girl is busied in adorning her doll, she insensibly becomes expert at needle-work, and learns how to adjust her own dress in a becoming manner. And therefore, if she be kindly treated, it will not be a matter of difficulty to prevail with her to apply to these branches of female education. Her mother or governess, if capable of managing her with mildness and prudence, may teach her to read with great facility. For being already more disposed to sedentary application than the boy of the same age, the confinement to which she must submit in order to learn to read will be less irksome to her. Some have pretended that the reasoning powers of girls begin to exert themselves sooner than those of boys. But, as we have already declared our opinion, that the reasoning powers of children of both sexes begin to display themselves at a very early period; so we do not believe that those of the one sex begin to appear, or attain maturity, sooner than those of the other. But the different occupations and amusements in which we cause them to engage from their earliest years, naturally call forth their powers in different manners, and perhaps cause the one to imitate our modes of speaking and behaviour sooner than the other. However, as we wish both boys and girls to learn the art of reading at a very early age, even as soon as they are capable of any serious application; so we wish girls to be taught the art of writing, arithmetic, and the principles of religion and morals, in the same order in which these are inculcated on boys.

We need not point out the reasons which induce us to regard these as accomplishments proper for the female sex: they seem to be generally considered as not only suitable, but necessary. It is our most important privilege, as beings placed in a situation different from that of the inferior animals, that we are capable of religious sentiments and religious knowledge; it there-

fore becomes us to communicate religious instruction with no less assiduity and care to the youth of the female sex than to those of our own. Besides, as the care of children during their earlier years belongs in a particular manner to the mother; she, therefore, whom nature has destined to the important duties of a mother, ought to be carefully prepared for the proper discharge of those duties, by being accurately instructed, in her youth, in such things as it will be afterwards requisite for her to teach her children.

Ladies have sometimes distinguished themselves as prodigies of learning. Many of the most eminent geniuses of the French nation have been of the female sex. Several of our countrywomen have also made a respectable figure in the republic of letters. Yet we cannot approve of giving girls a learned education. To acquire the accomplishments which are more proper for their sex, will afford sufficient employment for their earlier years. If they be instructed in the grammar of their mother-tongue, and taught to read and speak it with propriety; be taught to write a fair hand, and to perform with readiness the most useful operations of arithmetic: if they be instructed in the nature of the duties which they owe to God, to themselves, and to society; this will be almost all the literary instruction necessary for them. Yet we do not mean to forbid them an acquaintance with the literature of their country. The periodical writers, who have taught all the duties of morality, the decencies of life, and the principles of taste, in so elegant and pleasing a manner, may with great propriety be put into the hands of our female pupil. Neither will we deny her the historians, the most popular voyages and travels, and such of our British poets as may be put into her hands without corrupting her heart or inflaming her passions. But could our opinion or advice have so much influence, we would endeavour to persuade our countrymen and countrywomen to banish from among them the novelists, those panders of vice, with no less determined severity than that with which Plato excludes the poets from his republic, or that with which the converts to Christianity, mentioned in the Acts, condemned their magical volumes to the flames. Unhappily, novels and plays are almost the only species of reading in which the young people of the present age take delight; and nothing has contributed more effectually to bring on that dissoluteness of manners which prevails among all ranks.

But we will not discover so much austerity as to express a wish that the education of the female sex should be confined solely to such things as are plain and useful. We forbid not those accomplishments which are merely ornamental, and the design of which is to render them amiable in the eyes of the other sex. When we consider the duties for which they are destined by nature, we find that the art of pleasing constitutes no inconsiderable part of these; and it would be wrong, therefore, to deny them those arts, the end of which is to enable them to please. Let them endeavour to acquire taste in dress: to dress in a neat graceful manner, to suit colours to her complexion, and the figure of her clothes to her shape, is no small accomplishment for a young woman. She who is rigged out by the taste and dexterity of her maid and her milliner, is nothing better than a doll

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Similarity
of the cha-
racters of
both sexes
in the first
period of
life.

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Erudition,
how far be-
coming in
ladies.

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Ornament-
al accom-
plishments.

Education.
81
Dancing.

sent abroad to public places as a sample of their handy-work. Dancing is a favourite exercise; nay, we might almost call it the favourite study of the fair sex: So many pleasing images are associated with the idea of dancing; dress, attendance, balls, elegance and grace of motion irresistible, admiration, and courtship: and these are so early inculcated on the young by mothers and maids, that we need not be surprised if little Miss consider her lesson of dancing as a matter of much more importance than either her book or sampler. And indeed, though the public in general seem at present to place too high a value on dancing; and though the undue estimation which is paid to it seems owing to that taste for dissipation, and that rage for public amusements, which naturally prevail amid such refinement and opulence; yet still dancing is an accomplishment which both sexes may cultivate with considerable advantage. It has an happy effect on the figure, the air, and the carriage; and we know not if it be not favourable even to dignity of mind: Yet, as to be even a first-rate poet or painter, and to value himself on his genius in these arts, would be no real ornament to the character of a great monarch; so any very superior skill in dancing must serve rather to disgrace than to adorn the lady or the gentleman. There are some arts in which, though a moderate degree of skill may be useful or ornamental, yet superior taste and knowledge are rather hurtful, as they have a tendency to seduce us from the more important duties which we owe to ourselves and to society. Of those, dancing seems to be one: It is said of a certain Roman lady, by an eloquent historian, "that she was more skilled in dancing than became a modest and virtuous woman."

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Music.

Music, also, is an art in which the youth of the female sex are pretty generally instructed; and if their voice and ear be such as to enable them to attain any excellence in vocal music, it may conduce greatly to increase their influence over our sex, and may afford a pleasing and elegant amusement to their leisure hours. The harpsichord and the spinnet are instruments often touched by female hands; nor do we presume to forbid the ladies to exercise their delicate fingers in calling forth the enchanting sounds of these instruments. But still, if your daughter have no voice or ear for music, compel her not to apply to it.

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Drawing.

Drawing is another accomplishment which generally enters into the plan of female education. Girls are usually taught to aim at some scratches with a pencil: but when they grow up, they either lay it totally aside, or else apply to it with so much assiduity as to neglect their more important duties. We do not consider skill in drawing, any more than skill in poetry, as an accomplishment very necessary for the ladies; yet we agree with Rousseau, that as far as it can contribute to improve their taste in dress, it may not be improper for them to pursue it. They may very properly be taught to sketch and colour flowers; but we do not wish them to forget or lay aside this as soon as the drawing-master is dismissed: let them retain it to be useful through life. Though pride can never be lovely, even in the fairest female form; yet ought the young woman to be carefully impressed with a due respect for herself. This will join with her native modesty to be the guardian of her virtue, and to preserve her from levity and impropriety of conduct.

Such are the hints which have occurred to us on the Education proper for the female sex, as far as it ought to be conducted in a manner different from that of the male.

IX. *Public and private Education.*

One question usually discussed by the writers on this subject has not hitherto engaged our attention. It is, Whether it be most proper to educate a young man privately, or send him to receive his education at a public school? This question has been so often agitated, and by people enjoying opportunities of receiving all the information which experience can furnish on the subject, that we cannot be expected to advance any new argument of importance on either side. Yet we may state what has been urged both on the one and the other.

They who have considered children as receiving their education in the house and under the eye of their parents, and as secluded in a great measure from the society of other children, have been sometimes led to consider this situation as particularly favourable for their acquiring useful knowledge, and being formed to virtuous habits. Though we reap many advantages from mingling in social life, yet in society we are also tainted with many vices to which he who passes his life in solitary retirement is a stranger. At whatever period of life we begin to mix with the world, we still find that we have not yet acquired sufficient strength to resist those temptations to vice with which we are there assailed. But if we are thus ready to be infected with the contagion of vice, even at any age, no other argument can be necessary to show the propriety of confining children from those dangerous scenes in which this infection is so easily caught. And whoever surveys the state of morals in a public school with careful and candid attention, even though it be under the management of the most virtuous, judicious, and assiduous teachers, will find reason to acknowledge, that the empire of vice is established there not less fully than in the great world. Nothing, therefore, can be more negligent or inhuman, than for parents to expose their children to those seductions which a great school presents, at a time when they are strongly disposed to imitate any example set before them, and have not yet learned to distinguish between such examples as are worthy of imitation, and those which ought to be beheld with abhorrence. Even when under the parent's eye, from intercourse with servants and visitors their native innocence is likely to suffer considerably. Yet the parent's care will be much more likely to preserve the manners of his child uncorrupted in his own house, than any assiduity and watchfulness of his teachers in a school.

The morals and dispositions of a child ought to be the first objects of our concern in conducting his education: but to initiate him in the principles of useful knowledge is also an important object; and it will be happy, if in a private education virtue be not only better secured, but knowledge also more readily acquired, than in a public. But this actually happens. When one or two boys are committed to the care of a judicious tutor, he can watch the most favourable seasons for communicating instruction; he can awake curiosity and command attention by the gentle arts of insinuation: though he strive not to inflame their breasts with emulation, which leads often to envy and inveterate

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Arguments
for private
education.

Education. rate hatred; yet he will succeed in rendering learning pleasing, by other means less likely to produce unfavourable effects on the temper and dispositions of his pupils. As his attention is not divided among a number, he can pay more regard to the particular dispositions and turn of mind of each of his pupils: he can encourage him who is modest and slow, and repress the quickness and volatility of the other; and he can call forth and improve their powers, by leading them at one time to view the scenes of nature and the changes which she successively undergoes through the varying seasons; at another, to attend to some of the most entertaining experiments of natural philosophy; and again alluring them artfully to their literary exercises. With these he may mix some active games; and he may assume so much of the fondness of the parent, as to join in them with his little pupils. These are certainly circumstances favourable both to the happiness and to the literary improvement of youth; but they are peculiar to a private education. Besides, in a private education, as children spend more of their time with grown up people than in a public; those, therefore, who receive a domestic education, sooner acquire our manner of thinking, of expressing ourselves, and of behaving, in our ordinary intercourse with one another. For the very same reason for which girls are often observed to be capable of prudence and propriety of behaviour at an earlier age than boys, those boys who receive a family education will begin sooner to think and act like men, than those who pass their earlier days in a public seminary. And though you educate your son at home, there is no reason why he should be more accustomed to domineer over his inferiors, or to indulge a capricious or inhumane disposition, than if he were brought up among fifty boys, all of the same age, size, and rank, with himself. He may also, in a private education, exercise his limbs with the same activity as in a public one. He cannot, indeed, engage in those sports for which a party of companions is necessary; but still there are a thousand objects which will call forth his activity: if in the country, he will be disposed to fish, to climb for bird-nests, to imitate all that he sees performed by labourers and mechanics: in short, he will run, leap, throw and carry stones, and keenly exert himself in a variety of exercises, which will produce the most favourable effects on the powers both of his mind and body. It may indeed be possible for you to oppose the designs of nature so effectually, if you take pains for that purpose, as to repress the natural activity of your child or pupil, and cause him to pine away his time in listless indolence; but you will thus do violence to his dispositions, as well as to those instincts which nature has for wise purposes implanted in his breast. And the bad consequences which may result from this management are not to be considered as the natural effects of a domestic education, but as the effects of an education carelessly or imprudently conducted.

But there is another consideration which will perhaps be still more likely than any of those which we have hitherto urged, to prevail with the fond parent to give his child a private education. As the infant who is abandoned by its mother to the care of an hireling nurse, naturally transfers its affection from the unnatural parent to the person who supplies her room

and performs the duties incumbent upon her; so the boy who is banished from his parent's house at a time when he has scarce begun to know the relation in which he stands to his father and mother, brothers or sisters, soon ceases to regard them with that fondness which he had contracted for them from living in their company and receiving their good offices. His respect, his affection, and his kindness, are bestowed on new objects, perhaps on his master or his companions; or else his heart becomes selfish and destitute of every tender and generous feeling; and when the gentle and amiable affections of filial and fraternal love are thus, as it were, torn up by the roots, every evil passion springs up, with a rapid growth, to supply their place. The boy returns afterwards to his father's house: but he returns as a stranger; he is no longer capable of regarding his parents and relations with the same tenderness of affection. He is now a stranger to that filial love which springs up in the breast of the child who is constantly sensible of the tender care of his parents, and spends his earlier years under their roof, in such a manner as to appear the effect of instinct rather than of habit. Selfish views are now the only bond which attaches him to his parents and relations; and by coming under their influence at so early a period of life, he is rendered for ever incapable of all the most amiable virtues which can adorn human nature. Let the parent, therefore, who loves his child, and wishes to obtain from him a mutual return of affection, beware of excluding him from his house, and devolving the sole charge of him upon another, in his childhood.

These views represent a private education as the most favourable to virtue, to knowledge, and to the mutual affection which ought always to unite the parent and his child. But let us now listen to the arguments which are usually urged in behalf of a public education.

In the first place, it has been asserted, that a public ⁸⁵ education is much more favourable than a private to ^{Arguments for public} the pupil's improvement in knowledge, and much ^{education.} more likely to inspire him with an ardour for learning. In a private education, with whatever assiduity and tenderness you labour to render learning agreeable to your pupil, still it will be but an irksome task. You may confine him to his books but for a very short space in the course of the day, and allow him an alternation of study and recreation. Still, however, you will never be able to render his books the favourite objects of his attention. He will apply to them with reluctance and careless indifference: even while he seems engaged on his lesson, his mind will be otherwise occupied; it will wander to the scenes where he pursues his diversions, and to those objects which have attracted his desires. If the period during which you require his application be extremely short; during the first part of it, he will still be thinking of the amusements from which you have called him, and regretting his confinement; during the last, he will fondly anticipate the moment when he is to be set at liberty, and think of new amusements. Again, if you confine him during a longer period, still more unfavourable effects will follow. Peevishness, dulness, and a determined aversion to all that bears the name of literature, will be.

Education. be naturally impressed on his mind by such treatment. How can it be otherwise? Books possess so few of those qualities which recommend any object to the attention of children, that they cannot be naturally agreeable. They have nothing to attract and detain the eye, the ear, or any of the senses; they present things with which children are unacquainted, and of which they know not the value: children cannot look beyond the letters and words, to the things which these represent; and even though they could, yet is it much more pleasing to view scenes and objects as they exist originally in nature, than to trace their images in a faint and imperfect representation. It is vain, therefore, to hope that children will be prevailed with to pay attention to books by means of any allurements which books can of themselves present. Other means must be used; but those in a private education you cannot command. In a public seminary, the situation of masters with respect to their pupils is widely different. When a number of boys meet together in the same school, each of them soon begins to feel the impulse of a principle which enables the master to command their attention without difficulty, and prompts them to apply with cheerful ardour to tasks which would otherwise be extremely irksome. This principle is a generous emulation, which animates the breast with the desire of superior excellence, without inspiring envy or hatred of a competitor. When children are prudently managed in a great school, it is impossible for them not to feel its impulse. It renders their tasks scarce less agreeable than their amusements, and directs their activity and curiosity to proper objects. View the scholar at a public school, composing his theme, or turning over his dictionary; how alert! how cheerful! how indefatigable! He applies with all the eagerness, and all the perseverance, of a candidate for one of the most honourable places in the temple of fame. Again, behold and pity that poor youth who is confined to his chamber with no companion but his tutor; none whose superiority can provoke his emulation, or whose inferiority might flatter him with thoughts of his own excellence, and thus move him to preserve by industrious application the advantages which he has already gained. His book is before him; but how languid, how listless his posture! how heavy and dull his eye! Nothing is expressed in his countenance but dejection or indignation. Examine him concerning his lesson; he replies with confusion and hesitation. After a few minutes observation, you cannot fail to be convinced that he has spent his time without making any progress in learning; that his spirits are now broken, his natural cheerfulness destroyed, and his breast armed with invincible prejudices against all application in the pursuit of literary knowledge. Besides, in a school there is something more than emulation to render learning less disagreeable than it naturally is to children. The slightest observation of life, or attention to our own conduct in various circumstances, will be sufficient to convince us, that whenever mankind are placed in circumstances of distress, or subjected to any disagreeable restraint, that which a single person bears with impatience or dejection will make a much less impression on his mind if a number of companions be joined with him in his suffering or restraint. It is esteemed a piece of much greater severity to confine a prisoner

in a solitary cell, than when he is permitted to mix with others in the same uncomfortable situation. A journey appears much less tedious to a party of travellers, than to him who beats the path alone. In the same manner, when a number of boys in a great school are all busied on the same or on similar tasks, a spirit of industry and perseverance is communicated from one to another over the whole circle; each of them insensibly acquires new ardour and vigour; even though he feel not the spur of emulation, yet, while all are busy around him, he cannot remain idle. These are facts obvious to the most careless observer.

Neither are public schools so unfavourable to the virtue of their members as they have been represented to be. If the masters are men of virtue and prudence, careful to set a good example before their pupils, attentive to the particular character and behaviour of each individual among them, firm to punish obstinate and incorrigible depravity, and even to expel those who are more likely to injure the morals of others than to be reclaimed themselves, and at the same time eager to applaud and to encourage amiable and virtuous dispositions wherever they appear; under the government of such masters, a public school will not fail to be a school of virtue. There will no doubt be particular individuals among the pupils of such a seminary, whose morals may be corrupt and their dispositions vicious; but this, in all probability, will arise from the manner in which they were managed before entering the school, or from some other circumstances, rather than from their being sent for their education to a public school. Again, at a public school young people enjoy much greater advantages for preparing them to enter the world, than they can possibly be favoured with if brought up in a private and solitary manner. A great school is a miniature representation of the world at large. The objects which engage the attention of boys at a school are different from those which occupy their parents; the views of the boys are less extensive, and they are not yet capable of prosecuting them by so many base and mean arts: but, in other respects, the two scenes and the actors upon them nearly resemble each other; on both you behold contending passions, opposite interests, weakness, cunning, folly, and vice. He therefore who has performed his part on the miniature scene, has rehearsed as it were for the greater; if he has acquitted himself well on the one, he may be also expected to distinguish himself on the other; and even he who has not distinguished himself at school, at least enters the world with superior advantages when viewed in comparison with him who has spent his earlier days in the ignorance and solitude of a private and domestic education. Besides, when a number of boys meet at a public seminary of education, separated from their parents and relations; nearly of the same age, engaged in the same studies, and fond of the same amusements; they naturally contract friendships with one another which are more cordial and sincere than any that take place between persons farther advanced in life. A friendship is often formed between two boys at school which continues through life, and is productive of the happiest consequences to each of them. While at school, they mutually assist and encourage each other in their learning; and their mutual affection renders their tasks less burdensome

Education. densome than they might otherwise find them. As they advance in life, their friendship still continues to produce happy effects on their sentiments and conduct: perhaps they are mutually useful to each other by interest or by personal assistance in making their way in the world; or when they are engaged in the cares and bustle of life, their intercourse and correspondence with each other may contribute much to console them amid the vexations and fatigues to which they may be exposed.

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Such are the chief arguments usually adduced in favour of a public education. When we compare them with those which have been urged to recommend a private education, we will perhaps find that each has its peculiar advantages. A public education is the more favourable to the acquisition of knowledge, to vigour of mind, and to the formation of habits of industry and fortitude. A private education, when judiciously conducted, will not fail to be peculiarly favourable to innocence and to mildness of disposition; and notwithstanding what has sometimes been advanced by the advocates for a public education, it is surely better to keep youth at a distance from the seductions of vice till they be sufficiently armed against them, than to expose them to them at an age when they know not to what dangers they lead, and are wholly unable to resist them. Were we to give implicit credit to the specious talk of the two parties, either a private or a public education would form characters more like to angels than to those men whom we ordinarily meet in the world: but they speak with the ardour of enthusiasts; and therefore we must listen with caution both to the facts which they adduce, and to the inferences which they draw. Could we, without exposing children to the contagion of a great town, procure for them the advantages of both a public and a private education at the same time, we would by this means probably succeed best in rendering them both respectable scholars and good men. If we may presume to give our opinion freely, we would advise parents never, except when some unavoidable necessity of circumstances obliges them, to expel their children from under their own roof till they be advanced beyond their boyish years: let the mother nurse her own child; let her and the father join in superintending its education: they may then expect to be rewarded, if they have acted their parts aright, by commanding the gratitude, the affection, and the respect of their child, while he and they continue to live together. Let matters be so ordered, that the boy may reside in his father's house, and at the same time attend a public school: but let the girl be educated wholly under her mother's eye.

X. On Travel.

87
Travel considered in general.

ANOTHER question which has been often discussed comes here under our review. The philosophers of ancient Greece travelled in search of knowledge. Books were then scarce, and those few which were to be obtained were no very rich treasuries of useful information. The rhapsodies of a poet, the rude legends of some ill-informed and fabulous historian, or the theories of fanciful philosophers, were all that they could afford. Thales, Lycurgus, Solon, Plato, travelled, seeking that knowledge among more civilized

Education. nations which they could not find in their native country. In the course of their travels, they heard the lectures of celebrated philosophers; consulted the priests, who were the guardians of the traditions of antiquity, concerning the nature and origin of those traditions; and observed the institutions of those nations which were most renowned for the wisdom of their legislature. When they set out to visit foreign countries, they seem to have proposed to themselves a certain end; and by keeping that end steadily in view during the course of their travels, they gained such improvement as to be able on their return to command the veneration of their countrymen by means of the knowledge which they were enabled to communicate. Many besides the philosophers of ancient Greece have travelled for improvement, and have succeeded in their views. But ancient history does not relate to us, that travelling was considered by the Greeks or Romans as necessary to finish the education of their young men of fortune before they entered the scenes of active life. It is true, after Greece became a province of the Roman empire, and the Romans began to admire the science and elegance of Greece, and to cultivate Grecian literature, the young noblemen of Rome often repaired to Rhodes and Athens to complete their studies under the masters of philosophy and eloquence who taught in those cities. But they went thither with the same views with which our youth in modern times are sent to free schools and universities, not to acquire knowledge by the observation of nature, of the institutions, manners, and customs of nations; but merely to hear lectures, read books, and perform exercises. In modern times, a few men of reflection and experience have now and then travelled for improvement: but the greatest part of our travellers, for a long time, were enthusiastic devotees who went in pilgrimage to visit the shrine or relics of some favourite saint; soldiers, who wandered over the earth to destroy its inhabitants; or merchants, whose business as factors between widely distant countries and nations led them to brave every danger in traversing from one corner of the globe to another. But since the nations of modern Europe have begun to emerge from rudeness, ignorance, and servile depression, they have formed one great commonwealth, the members of which are scarcely intimately connected with each other than were the states of ancient Greece. The consequence of this mutual connection and dependence is, that almost all the nations of Europe have frequent intercourse with one another; and as some of them are and have long been more enlightened and refined than others, those nations who have attained the highest degrees of civilization and refinement have naturally attracted the admiration and homage of the rest. Their language has been studied, their manners and arts have been adopted, and even their dress has been imitated. Other nations have thronged to pay the homage due to their superior merit, and to study under them as masters. Hence has arisen the practice which at present prevails among us of sending our youth to complete their education by travelling, before we introduce them to active life, or require them to engage in business. Formerly young men were not sent to travel till after they had proceeded through the forms of a regular education, and had at least attained such an age that they were no longer

Education. to be considered as mere boys. But the progress of luxury, the desire of parents to introduce their children into the world at an early age that they may early attain to wealth and honours, and various other causes, have gradually introduced the practice of sending mere boys to foreign countries, under pretence of affording them opportunities of shaking off prejudices, of storing their minds with truly useful knowledge, and of acquiring those graceful manners and that manly address which will enable them to acquit themselves in a becoming manner when they are called to the duties of active life. How much travelling at such an early age contributes to fulfil the views of parents, a slight survey of the senate-house, the gambling-houses, the race course, and the cockpit, will readily convince the sagacious observer.

But we wish to foster no prejudices against neighbouring nations; we entertain no such prejudices in favour of Britain, as to wish to confine our countrymen within the sea-girt isle. Let us inquire, what advantages may be gained by travelling, and at what age it may be most proper to set out in pursuit of those advantages.

88
Travel necessary to the acquisition of knowledge.

After all that bookish men have urged, and notwithstanding all that they may continue vehemently to urge, in behalf of the knowledge to be derived from their beloved books; it must still be acknowledged, that books can teach us little more than merely the language of men. Or, if we should grant that books are of higher importance, and that language is the least valuable part of the knowledge which they teach, yet still we need to beware that they lead us not astray; it is better to examine nature with the naked eye, than to view her through the spectacles of books. Neither the theories or experiments of philosophers, nor the narratives of travellers, nor the relations of historians, though supported by a numerous train of authorities, are worthy of implicit credit. You retire from the world, confine yourself for years to your closet, and read volume after volume, historians, philosophers, and poets; at last you fancy that you have gained an immense store of knowledge: But leave your retirement, return into the world, compare the knowledge which you have treasured up with the appearances of nature; you will find that you have laboured in vain, that it is only the semblance of knowledge which you have acquired, and will not serve for a faithful guide in life, nor even enable you to distinguish yourself for literary merit. Compare the relations of travellers with one another; how seldom do they agree when they describe the same scenes and the same people! Turn your attention to the most respectable historians, compare their accounts of the same events; what disagreement! what contrariety! Where shall truth be found? Listen to the cool, the candid philosophers; what contradictory theories do they build on the same system of facts!

We agree, then, that it is better to seek knowledge by actual observation and experiment, than to receive it at second-hand from the information of others. He who would gain an acquaintance with the beauties of external nature, must view them with his own eyes; he who would know the operations of the human understanding, must reflect upon what passes in his own mind; he who would know the customs, opinions,

Education. and manners of any people, must mingle with them, must observe their conduct, and listen to their conversation. The arts are acquired by actual practice; the sciences by actual observation in your own person, and by deducing inferences from your observations.

If therefore to extend our knowledge can contribute in any degree to render us happier, wiser, or better; travelling, as being more favourable to knowledge than the study of books, must be highly advantageous. Get well acquainted with your own country; with the manners, the customs, the laws, and the political situation of your countrymen: Get also a knowledge of books; for books would not be altogether useless, though they could serve no other purpose but to teach us the language in which mankind express themselves: And then, if your judgment have attained maturity; if curiosity prompt you; if your constitution be robust and vigorous, and your spirits lively; you may imitate the Solons, Homers, and Platos of old, and visit foreign countries in search of knowledge, and with a view to bring home something which may be of real utility to yourself and your country. You will, by this time, be so much master of the language of your own country, that you will not lose it while you are learning the languages of foreign nations; your principles of taste and of right and wrong will be so formed and fixed, that you will not despise any institution or custom or opinion merely because it prevails not in your own country; nor yet will you be ready to admire and adopt any thing, merely because it prevails among a foreign nation who are distinguished for profound and extensive knowledge, or for elegance of taste and manners. No; you will divest yourself of every prejudice, and judge only by the fixed unalterable principles which determine the distinction between right and wrong, between truth and falsehood, between beauty and deformity, sublimity and meanness. Your object will not be to learn exotic vices, to mingle in frivolous amusements, or to form a catalogue of inns. Your views, your inquiries, will have a very different direction. You will attend to the state of the arts, of the sciences, of morals, manners, and government; you will also contemplate with eager delight, the grand or beautiful scenes of nature, and examine the vegetable productions of the various regions through which you pass, as well as the different tribes of animals which inhabit them; you will observe what blessings the beneficence of nature has conferred on the inhabitants of each particular division of the globe, and how far the ingenuity and industry of man have taken advantage of the kindness of nature. Thus surveying the face of the earth, and considering how advantages and disadvantages are balanced with each other through every various region and climate from one extremity of the globe to another; you will admire and revere that impartiality with which the Author of nature has distributed his benefits to the whole human race. When from the chilly climes and stubborn soil of the north, you turn your eyes to the fertile, genial regions of the south, where every tree is loaded with exquisite fruits, and every vegetable is nourishing and delicious; you will be pleased to find, that the inhabitants of the north, by their superior ingenuity and vigour, are able to raise themselves to circumstances

Education. no less comfortable and respectable than those which the nations inhabiting between the tropics enjoy: when you behold the French shaking off the yoke of despotism, and aspiring to the sweets of liberty as well as their British neighbours; you will be pleased to see, that the natural gaiety and cheerfulness of the former nation render them not incapable of the energy of the latter. You will be pleased to view the remains of antiquity, and the noble monuments of art; but you will think it below you to trifle away your time in gazing at palaces and churches, and collecting rusty medals and fragments of marble; you will seek the society of eminent men, and eagerly cultivate an acquaintance with the most distinguished artists and men of science who adorn the nations among whom you may happen to sojourn: Knowing that the knowledge which is to be acquired in great towns, is by no means an adequate compensation for the vicious habits which you are liable to contract in them; and besides, that the luxuries, the arts, the manners, the virtues, and the vices of all great towns are nearly the same, so that when you have seen one, you have seen all others; you will avoid taking up your residence for any considerable time in any of the great towns through which you have occasion to pass in the course of your travels. The traveller who has attained the previous accomplishments which we have mentioned as necessary, who sets out with the views which we have supposed him to entertain, and who conducts his travels in this manner, cannot fail to return home enriched with much useful knowledge; he cannot but derive more real improvement from travelling, than he could have gained by spending the same period of time in solitary study: when he returns to his native country, he will appear among his countrymen as more than a philosopher; a sage, and a benefactor. His knowledge is so extensive and accurate, his views are so liberal and enlarged, and he is so superior to prejudices, without being the enemy of any useful establishments, that he will be enabled to command universal esteem, by performing his part in life with becoming dignity and propriety, and perhaps to render his name illustrious, and his memory dear to future times, by some important services to the community to which he belongs, or even to mankind in general.

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Circumstances that render travelling unprofitable to the youth of the present age.

But though we have thus far, and we hope for obvious and solid reasons, decided in favour of travelling, as being more likely than a solitary application to books, to furnish the mind with useful and ornamental knowledge; yet we do not see that our British youth either take care to furnish themselves with the previous knowledge which we consider as indispensably necessary in order to prepare them for travelling with advantage, or set out with proper views, or prosecute their travels in a prudent, judicious manner. After receiving a very imperfect education, in which religious and moral instruction are almost wholly neglected, and no means are used to inspire the youthful mind with solid, virtuous, manly qualities; but every art is tried to make the young man appear learned, while his mind is destitute of all useful information, and to teach him to assume the confidence of manhood before he has attained even to a moderate degree of sense and prudence;—after an education conducted

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Education. in this manner, and with these views, the stripling is sent abroad to view the world, and is expected to return home a finished character, an ornament and a comfort to his parents and all his connections. He is hitherto unacquainted, perhaps, even with the simple events of the history of his native country; and either totally ignorant of classical literature, or but very superficially instructed in it. He has not yet viewed with a discerning eye the manners and customs prevailing among his countrymen; he knows not the nature of the government under which he lives, nor the spirit of those laws by which his civil conduct must be regulated. He has no fixed principles; no clear, distinct views. But to supply all his wants of this nature, he is put into the hands of a travelling governor, who is to be entirely submissive to his will, and yet to serve him both for eyes and intellect. This governor is generally either some macaroni officer who is considered as well bred, and thought to know the world; or else, perhaps, some cringing son of literature, who having spent much time among his books, without acquiring such strength or dignity of mind as to raise him above frivolity of manners and conversation or pitiful fawning arts, is therefore regarded as happily qualified for this important charge. This respectable personage and his pupil are shipped off for France, that land of elegant dissipation, frivolity, and fashion. They travel on with eager impatience till they reach the capital. There the young man is industriously introduced to all the gay scenes which Paris can display. He is, at first, confounded; by and by his senses are fascinated; new desires are awakened in his breast; all around him he sees the sons of dissipation wallowing in debauchery, or the children of vanity fluttering about like so many gawdy insects. The poor youth has no fixed principles: he has not been taught to regard vanity as ridiculous, or to turn from vice with abhorrence. No attempt is made to allure him to those objects, an attention to which can alone render travelling truly beneficial. Hitherto his mind had been left almost wholly uncultivated; and now, the seeds of vice are plentifully sown in it. From one great town he is conveyed to another, till he visits almost every place in Europe where profligacy of manners has attained to any uncommon height. In this happy course of education he probably continues to pursue improvement till he is well acquainted with most of the post-roads, the principal inns, and the great towns at least in France and Italy; and perhaps till he has worn out his constitution, and rendered his mind totally incapable of any generous sentiments or sober reflection. He then revisits his native country, to the inexpressible happiness of his parents, who now eagerly long to embrace their all-accomplished child. But how miserably are the poor folks disappointed, when they find his constitution wasted, his understanding uninformed, his heart destitute of every manly or generous sentiment; and perceive him to possess no accomplishment, but such as are merely superficial? Perhaps, however, his parents are prevented by their partiality both for their child and for the means which they have adopted in conducting his education, from viewing his character and qualifications in a true light. Perhaps they overlook all his defects, or

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Education. consider them as ornaments, and regard their dear son as the mirror of perfection. But, unfortunately, though they be blind to the hideous deformity of the monster which they have formed, they cannot hinder it from being conspicuous to others; though they may view their son's character as amiable and respectable, they cannot render it useful, they cannot prevent it from being hurtful to society. Let this youth whose education has been thus wisely conducted, let him be placed at the head of an opulent fortune, advanced to a seat in the legislative body of his country, or called to act in any public character; how will he distinguish himself? As the virtuous patriot, the honest, yet able statesman, the skilful general, or the learned, upright judge? How will he enjoy his fortune? Will he be the friend of the poor, the steady supporter of the laws and constitution under whose protection he lives? Will he show himself capable of enjoying *otium cum dignitate*? If we reason by the usual laws of probability, we cannot expect that he should: and if we observe the manners and principles of our men of wealth and high birth who have been brought up in this manner, we find our reasonings confirmed.

Such are the opinions which candid observation leads us to entertain with regard to the advantages which may be gained by travelling.

He whose mind has been judiciously cultivated, and who has attained to maturity of judgment, if he set out on his travels with a view to obtain real improvements, and persist invariably in the prosecution of that view, cannot but derive very great advantage from travelling.

But again, those young men whose minds have not been previously cultivated by a judicious education, who set out without a view to the acquisition of real knowledge, and who wander among foreign nations, without attention to any thing but their luxuries, their follies, and their vices; those poor young men cannot gain any real improvement from their travels.

Our countrymen, who travel for improvement, do not appear to derive so much advantage from their travels as were to be wished, because they generally receive too superficial an education, set out at too early a period of life, and direct not their views to objects of real utility and importance.

XI. *On Knowledge of the World, and Entrance into Life.*

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Unhappy
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too early
introduc-
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the world

MUCH has been said concerning the utility of a knowledge of the world, and the advantage of acquiring it at an early period of life. But those who have the most earnestly recommended this knowledge of the world, have generally explained themselves in so inaccurate a manner concerning it, that it is difficult to understand what ideas they affix to it. They seem to wish, that, in order to acquire it, young people may be early made acquainted with all the vices and follies of the world, introduced into polite company, carried to public places, and not confined even from the gaming-table and the stews. Some knowledge of the world may, no doubt, be gained by these means. But it is surely dearly purchased; nor are the advantages which can be derived from it so considerable, as to tempt the judicious and affectionate parent to expose his child to the infection of vanity, folly, and vice, for

their sake. Carry a boy or girl into public life at the age of fourteen or fifteen; show them all the scenes of splendid vanity and dissipation which adorn London or Paris; tell them of the importance of dress, and of the ceremonies of good breeding and the forms of intercourse; teach them that fashionable indifference and assurance which give the *ton* to the manners of our fine gentlemen and fine ladies of the present age. What effects can you expect the scenes into which you introduce them, and the mysteries which you now teach them, to produce on the minds of the children? They have a direct tendency to inspire them with a taste for vanity, frivolity, and dissipation. If you wish them to be like the foolish, the dissipated, and the gay, you are likely to obtain your purpose; but if, on the contrary, your views are to prepare them for discharging the duties of life, you could not adopt more improper means: for though they be well acquainted with all those things on which you place so much value, yet they have not thereby gained any accession of useful knowledge. They are not now more able than before to estimate the real value of objects; nay, their judgment is now more liable than before to be misled in estimating the value of the objects around them. Luxury, vanity, and fashion, have stamped on many things an ideal value. By mingling at an early age in those scenes of the world where luxury, vanity, and fashion reign with arbitrary sway, young people are naturally impressed with all those prejudices which these have a tendency to inspire. Instead of acquiring an useful knowledge of the world, they are rendered incapable of ever viewing the world with an unprejudiced and discerning eye. If possible, therefore, we should rather labour to confine young people from mingling in the scenes of gay and dissipated life till after they have attained maturity of age and judgment. They will then view them in a proper light, and perhaps be happy enough to escape the infectious contagion of vice.

But there is another and a more valuable knowledge of the world, which we ought industriously to communicate to them as soon as they are capable of receiving it. As soon as they are made thoroughly acquainted with the distinctions between right and wrong, between virtue and vice, between piety and impiety, and have become capable of entering into our reasonings; we ought then to inform them concerning the various establishments and institutions which exist in society; concerning the customs, opinions, and manners of mankind; and concerning the various degrees of strength or weakness of mind, of ingenuity or dullness, of virtuous or vicious qualities, which discriminate those characters which appear in society. We ought also to seize every opportunity which may be presented of exemplifying our lessons by instances in real life. We must point out to them those circumstances which have led mankind to place an undue value on some objects, while they appretiate others much below their real utility and importance. Thus let us fortify their judgments against that impression which the dazzling novelty of the scene, and the force of passion, will be apt to produce; and communicate to them a knowledge of the world, without exposing them imprudently to the contagion of its vices and follies.

When at length the period arrives at which they must

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must be emancipated from subjection, and committed to the guidance of their own conscience and reason, and of those principles which we have laboured to inculcate on their minds; let us warn them of the dangers to which they are about to be exposed; tell them of the glory and the happiness to which they may attain; inspire them, if possible, with disdain for folly, vanity, and vice, whatever dazzling or enchanting forms they may assume; and then dismiss them to enrich their minds with new stores of knowledge by visiting foreign nations; or, if that should be inconvenient, to enter immediately on the duties of some useful employment in active life.

EDULCORATION, properly signifies the rendering substances more mild. Chemical edulcoration consists almost always in taking away acids and other saline substances; and this is effected by washing the bodies to which they adhere in a large quantity of water. The washing of diaphoretic antimony, powder of algaroth, &c. till the water comes off quite pure and insipid, are instances of chemical edulcoration.—In pharmacy, juleps, potions, and other medicines, are said to be *edulcorated*, by adding sugar or syrup.

EDWARD, the name of several kings of England. See (*History of*) ENGLAND.

EDWARDS (George), fellow of the royal and antiquarian societies, was born at Stratford, a hamlet belonging to Westham in Essex, on the 3d of April 1694. After having spent some time at school, he was put apprentice to a tradesman in Fenchurch-street. His master, who was eminent both for his piety and skill in the languages, treated him with great kindness; but about the middle of his apprenticeship, an accident happened which totally put a stop to the hopes of young Edwards's advancing himself in the way of trade. Dr Nicolas, a person of eminence in the physical world, and a relation of his master's, happened to die. The Doctor's books were removed to an apartment occupied by Edwards, who eagerly employed all his leisure-hours, both in the day and great part of the night, in perusing those which treated of natural history, sculpture, painting, astronomy, and antiquities. The reading of these books entirely deprived him of any inclination for mercantile business he might have formerly had, and he resolved to travel into foreign countries. In 1716, he visited most of the principal towns in Holland, and in about a month returned to England. Two years after, he took a voyage to Norway, at the invitation of a gentleman who was disposed to be his friend, and who was nephew to the master of the ship in which he embarked. At this time Charles XII. was besieging Frederickshall; by which means our young naturalist was hindered from making such excursions into the country as otherwise he would have done, for the Swedes were very careful to confine such strangers as could not give a good account of themselves. But notwithstanding all his precaution, he was confined by the Danish guard, who supposed him to be a spy employed by the enemy to get intelligence of their designs. However, by obtaining testimonials of his innocence, a release was granted. In 1718 he returned to England, and next year visited Paris by the way of Dieppe. During his stay in this country he made two journeys of 100 miles each; the first to Chalons in Champagne, in May 1720; the second on foot, to Orleans and Blois; but an edict

happening at that time to be issued for securing vagrants, in order to transport themselves to America, as the banks of the Mississippi wanted population; our author narrowly escaped a western voyage. On his arrival in England, Mr Edwards closely pursued his favourite study of natural history, applying himself to drawing and colouring such animals as fell under his notice. A strict attention to natural, more than picturesque beauty, claimed his earliest care: birds first engaged his particular attention; and having purchased some of the best pictures of these subjects, he was induced to make a few drawings of his own; which were admired by the curious, who encouraged our young naturalist to proceed, by paying a good price for his early labours. Among his first patrons and benefactors may be mentioned James Theobalds, Esq; of Lambeth; a gentleman zealous for the promotion of science. Our artist, thus unexpectedly encouraged, increased in skill and assiduity; and procured, by his application to his favourite pursuit, a decent subsistence and a large acquaintance. However, he remitted his industry in 1731; when, in company with two of his relations, he made an excursion to Holland and Brabant, where he collected several scarce books and prints, and had an opportunity of examining the original pictures of several great masters at Antwerp, Brussels, Utrecht, and other cities. In December 1733, by the recommendation of the great Sir Hans Sloane, Bart. president of the college of physicians, he was chosen librarian, and had apartments in the college. This office was peculiarly agreeable to his taste and inclination, as he had the opportunity of a constant recourse to a valuable library, filled with scarce and curious books on the subjects of natural history, which he so assiduously studied. By degrees he became one of the most eminent ornithologists in this or any other country. His merit is so well known in this respect, as to render any eulogium on his performances unnecessary: but it may be observed, that he never trusted to others what he could perform himself; and often found it so difficult to give satisfaction to his own mind, that he frequently made three or four drawings to delineate the object in its most lively character, attitude, and representation. In 1743, the first volume of the *History of Birds* was published in quarto. His subscribers exceeding even his most sanguine expectations, a second volume appeared in 1747. The third volume was published in 1750. In 1751, the fourth volume came from the press. This volume being the last he intended to publish at that time, he seems to have considered it as the most perfect of his productions in natural history; and therefore devoutly offered it up to the great God of nature, in humble gratitude for all the good things he had received from him in this world. Our author, in 1758, continued his labours under a new title, viz. *Gleanings of Natural History*. A second volume of the *Gleanings* was published in 1760. The third part, which made the seventh and last volume of his works, appeared in 1764. Thus our author, after a long series of years, the most studious application, and the most extensive correspondence to every quarter of the world, concluded a work which contains engravings and descriptions of more than 600 subjects in natural history, not before described or delineated. He likewise added a general index in French and English; which was afterwards perfected, with the Linnæan names,

Edwards.

Edwards
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Eeckhout.

by that great naturalist Linnæus himself, who frequently honoured him with his friendship and correspondence. Some time after Mr Edwards had been appointed library-keeper to the royal college of physicians, he was, on St Andrew's day, in the year 1750, presented with an honorary compliment by the president and council of the royal society, with the gold medal, the donation of Sir Godfrey Copley, Bart. annually given on that day to the author of any new discovery in art or nature, in consideration of his natural history just then completed. A copy of this medal he had afterwards engraved, and placed under the title in the first volume of his history. He was a few years afterwards elected fellow of the royal society, and of the society of antiquaries, London; and also a member of many of the academies of sciences and learning in different parts of Europe. In compliment to these honorary distinctions from such learned bodies, he presented elegant coloured copies of all his works, to the royal college of physicians, the royal society, the society of antiquarians, and to the British museum; also to the royal academy of sciences at Paris, from whom he received the most polite and obliging letter of thanks by their then secretary Monsieur Defouchy. His collection of drawings, which amounted to upwards of 900, were purchased by the earl of Bute. They contain a great number of British as well as foreign birds, and other animals hitherto not accurately delineated or described. After the publication of the last work, being arrived at his 70th year, he found his sight begin to fail, and his hand lost its wonted steadiness. He retired from public employment to a little house which he purchased at Plaistow; previous to which, he disposed of all the copies, as well as plates, of his works. The conversation of a few select friends, and the perusal of a few select books, were the amusement of the evening of his life; and now and then he made an excursion to some of the principal cities in England, particularly to Bristol, Bath, Exeter, and Norwich. Some years before his death, the alarming depredations of a cancer, which baffled all the efforts of physical skill, deprived him of the sight of one of his eyes: he also suffered much from the stone, a complaint to which at different periods of his life he had been subject. Yet it has been remarked, that, in the severest paroxysms of misery, he was scarcely known to utter a single complaint. Having completed his 80th year, emaciated with age and sickness, he died on the 23d of July 1773, deservedly lamented by a numerous acquaintance.

EDYSTONE LIGHT-HOUSE, lying off Plymouth harbour, was first erected by the corporation of the Trinity-house in 1696; in consideration of which, the masters, &c. of English shipping agreed to pay one penny a ton outwards and inwards. It was demolished by the storm of 1703, and re-erected by act of parliament in the 4th of queen Anne, and the same duty on tonnage of ships granted for its support; which law was enforced in the 8th of June. It has been since destroyed and rebuilt.

EECKHOUT (Gerbrant Vander), history and portrait painter, was born at Amsterdam in 1621, and was a disciple of Rembrandt; whose manner of designing, colouring, and penciling, he imitated so nearly, that it is difficult to distinguish between several of his paintings and those of his master. He painted after na-

ture, and with such a force as only nature can equal: his touch and his colouring are the same as Rembrandt's; but he rather excelled him in the extremities of his figures. His principal employment was for portraits; and in those he was admirable: but he surpassed all his contemporaries, in the power he had of painting the mind in the countenance. But although Eeckhout painted portraits to so great a degree of perfection, yet was he much more pleased to paint historical subjects, and he executed them with equal success. In that style his composition is rich and full of judgment; the distribution of his masses of light and shadow is truly excellent; and in the opinion of many connoisseurs, he had more transparence in his colouring, and better expression, than his master. He died in 1674.

EEL, in ichthyology, a species of MURÆNA.

EEL-Fishing. See BOBBING and SNIGGLING.

The silver-eel may be caught with several sorts of baits, as powdered-beef, garden-worms, minnows, hens-guts, fish-garbage, &c. The most proper time for taking them is in the night, fastening your line to the bank-sides, with your laying-hook in the water: or a line may be thrown with good store of hooks, baited and plumbed, with a float to discover where the line lies, that they may be taken up in the morning.

Microscopic EELS. See ANIMALCULE, n° 8.

EELS in Vinegar, are similar to those in sour paste. The taste of vinegar was formerly thought to be occasioned by the biting of these little animals, but that opinion has been long ago exploded. Mentzelius says, he has observed the actual transformation of these little creatures into flies: but as this hath never been observed by any other person, nor is there an instance of such a transformation in any other animalcule, it seems probable that Mentzelius hath been mistaken in his observations.

EEL-Spear, a forked instrument with three or four jagged teeth, used for catching of eels: that with the four teeth is best, which they strike into the mud at the bottom of the river, and if it strike against any eels it never fails to bring them up.

EFFARE', or EFFRAYE', in heraldry, a term applied to a beast rearing on its hind-legs, as if it were frightened or provoked.

EFFECT, in a general sense, is that which results from, or is produced by, any cause. See CAUSE.

EFFEMINATE, womanish, unmanly, voluptuous.

EFFEMINATE (*effeminati*), according to the vulgate, are mentioned in several places of scripture. The word is there used to signify such as were consecrated to some profane god, and prostituted themselves in honour of him. The Hebrew word *kadesh*, translated *effeminatus*, properly signifies *consecrated*, and hence was attributed to those of either sex, who publicly prostituted themselves in honour of Baal and Astarte. Moses expressly forbids these irregularities among the Israelites; but the history of the Jews shows, that they were notwithstanding frequently practised. Levit. xxiii. 18.

EFFENDI, in the Turkish language, signifies *master*: and accordingly it is a title very extensively applied; as, to the musti and emirs, to the priests of mosques, to men of learning, and of the law. The grand chancellor of the empire is called *reis-effendi*.

EFFERVESCENCE, an intestine motion excited betwixt the parts of two bodies of different natures, when

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57
Efflorescence.

when they reciprocally dissolve each other. Effervescences are commonly attended with bubbles, vapours, small jets of the liquid, and a hissing noise; and these phenomena are occasioned by the air which at that time disengages itself. Sometimes also they are accompanied with a great degree of heat, the cause of which is not so well known.

Formerly the word *fermentation*, was also applied to effervescences; but now that word is confined to the motion naturally excited in animal and vegetable matters, and from which new combinations among their principles take place.

EFFIGY, the portrait, figure, or exact representation of a person.

EFFIGY, is also used for the print or impression of a coin, representing the prince's head who struck it.

EFFIGY, to execute or degrade in, denotes the execution or degradation of a condemned contumacious criminal, who cannot be apprehended or seized. In France, they hang a picture on a gallows or gibbet, wherein is represented the criminal, with the quality or manner of the punishment: at the bottom is written the sentence or condemnation. Such persons as are sentenced to death are executed in effigy.

EFFLORESCENCE, among physicians, the same with exanthema. See EXANTHEMA.

EFFLORESCENCE, in chemistry, denotes the formation of a kind of mealy powder on the surface of certain bodies. Efflorescence is occasioned either by decomposition or drying. The efflorescence which happens to cobalt and martial pyrites is of the first; and that observed on the crystals of marine alkali, Glauber's salt, &c. of the latter kind. An efflorescence is sometimes also a species of crystallization, the nature of which is not well understood; as, the beautiful vegetations which shoot up from vitriolated tartar acidulated either with the vitriolic or nitrous acids, the saline spiculæ which are observed to shoot from salt butter, &c.

Besides the common crystallization of salts, all of them have the property of appearing in the form of an efflorescence, or small saline spiculæ, when mixed with any thick substance, particularly lime. Whatever salt happens to be made use of, there is little or no difference in the efflorescence. Thus, in butter very much salted, the sea-salt shoots in the form of long spiculæ, though the sea-salt itself never shoots but in the form of cubical crystals. In like manner, Glauber's salt will appear in the form of an efflorescence, as well as the fossil alkali, &c. nor will the form of the crystals of the efflorescence be perceptibly different from those of sea-salt. The efflorescences which we see very commonly upon walls are in general Glauber's salt. In some cases (but seldom in such efflorescences as we have examined) they are composed of fossil alkali. The reason of these differences is not known. In almost all cases of this kind there seems to be a real growth of salt. On one spot of a plaster wall about two feet square, which we observed particularly, this growth was very evident. The produce was a true Glauber's salt; and by frequently taking off the efflorescence, eight ounces were procured; nor did the prolific virtue of the wall seem to be in the least impaired by the waste.

EFFLORESCENTIA, in botany, (from *effloresco* to bloom); the precise time of the year and month in which every plant shows its first flowers.

Some plants flower twice a-year, as is common between the tropics; others oftener, as the monthly rose. The former are called by botanists *bifera*; the latter, *multifera*.

The time of flowering is determined by the degree of heat which each species requires. Mezerion and snow-drop produce their flowers in February; primrose, in the beginning of March; the greater number of plants, during the month of May; corn, and other grain, in the beginning of June; the vine, in the middle of the same month; several compound flowers, in the months of July and August; lastly, meadow-saffron flowers in the month of October, and announces the speedy approach of winter.

Grass of Parnassus always flowers about the time of cutting down the hay; and in Sweden, the different species of thistle, mountain-lettuce, succory, and balm, seldom flower till after the summer solstice: the country-men even know, as by a kalendar, that the solstice is past when these plants begin to produce their flowers.

The temperature of the seasons has a mighty influence both in accelerating and retarding the flowering of plants. All plants are earlier in warm countries: hence such as are cultivated out of their native soil, never flower till the heat of the climate, or situation into which they are removed, is equal to that under the influence of which they produced flowers in their own country. For this reason, all exotics from warm climates are later in this country than many plants which it naturally produces.

In general, we may observe, that the plants of the coldest countries, and those produced on the mountains in all climates, being of equal temperature, flower about the same time, viz. during our spring in Europe.

Plants that grow betwixt the tropics, and those of temperate climates, flower during our summer.

Plants of temperate climates, situated under the same parallel of latitude with certain parts of Europe, but removed much farther to the west, such as Canada, Virginia, and Mississippi, do not produce flowers till autumn.

Plants of temperate climates in the opposite hemisphere to Europe, flower during our winter, which is the summer of these regions.

Linnaeus and Adanson have given a sketch of the different times, in which plants flower at Upsal and Paris.

EFFLUVIUM, in physiology, a term much used by philosophers and physicians, to express the minute particles which exhale from most, if not all, terrestrial bodies, in form of insensible vapours.

EFFRONTES, in church-history, a sect of heretics, in 1534, who scraped their forehead with a knife till it bled, and then poured oil into the wound. This ceremony served them instead of baptism. They are likewise said to have denied the divinity of the Holy Spirit.

EFFUSION, the pouring out of any liquid thing with some degree of force. In the ancient heathen sacrifices

Efflorescentia
Effusion.

Effusion
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Egg.

crifices there were divers effusions of wine and other liquors, called *libations*.

EFFUSION, or FUSION, in astronomy, denotes that part of the sign Aquarius, represented on celestial globes and planispheres, by the water issuing out of the urn of the water-bearer.

EFT, in zoology, the English name of the common lizard. See LACERTA.

EGERIA, or ÆGERIA, a nymph held in great veneration by the Romans. She was courted by Numa Pompilius; and according to Ovid, she became his wife. This prince frequently visited her; and that he might introduce his laws and new regulations into the state, he solemnly declared before the Roman people, that they were previously sanctified and approved by the nymph Egeria. Ovid says, that Egeria was so disconsolate at the death of Numa, that she melted into tears, and was changed into a fountain by Diana. She is reckoned by many as a goddess who presided over the pregnancy of women; and some maintain that she is the same as Lucina.

EGG, in physiology, a body formed in certain females, in which is contained an embryo or fetus of the same species, under a cortical surface or shell. The exterior part of an egg is the shell; which in a hen, for instance, is a white, thin, and friable cortex, including all the other parts. The shell becomes more brittle by being exposed to a dry heat. It is lined every where with a very thin but a pretty tough membrane, which dividing at, or very near, the obtuse end of the egg, forms a small bag, where only air is contained. In new-laid eggs this follicle appears very little, but becomes larger when the egg is kept.

Within this are contained the albumen or white, and the vitellus or yolk; each of which have their different virtues.

The albumen is a cold, viscous, white liquor in the egg, different in consistence in its different parts. It is observed, that there are two distinct albumens, each of which is inclosed in its proper membrane. Of these one is very thin and liquid: the other is more dense and viscous, and of a somewhat whiter colour; but, in old and stale eggs, after some days incubation, inclining to a yellow. As this second albumen covers the yolk on all sides, so it is itself surrounded by the other external liquid. The albumen of a fecundated egg, is as sweet and free from corruption, during all the time of incubation, as it is in new-laid eggs; as is also the vitellus. As the eggs of hens consist of two liquors separated one from another, and distinguished by two branches of umbilical veins, one of which goes to the vitellus, and the other to the albumen; so it is very probable that they are of different natures, and consequently appointed for different purposes.

When the vitellus grows warm with incubation, it becomes more humid, and like melting wax or fat; whence it takes up more space. For as the fetus increases, the albumen insensibly wastes away and condenses: the vitellus, on the contrary, seems to lose little or nothing of its bulk when the fetus is perfected, and only appears more liquid and humid when the abdomen of the fetus begins to be formed.

The chick in the egg is first nourished by the albumen; and when this is consumed, by the vitellus, as

with milk. If we compare the chalazæ to the extremities of an axis passing through the vitellus, which is of a spherical form, this sphere will be composed of two unequal portions, its axis not passing through its centre; consequently, since it is heavier than the white, its smaller portion must always be uppermost in all positions of the egg.

The yellowish white round spot, called *cicatricula*, is placed on the middle of the smaller portion of the yolk; and therefore, from what has been said in the last paragraph, must always appear on the superior part of the vitellus.

Not long before the exclusion of the chick, the whole yolk is taken into its abdomen; and the shell, at the obtuse end of the egg, frequently appears cracked some time before the exclusion of the chick. The chick is sometimes observed to perforate the shell with its beak. After exclusion, the yolk is gradually wasted, being conveyed into the small-guts by a small duct.

Eggs differ very much according to the birds that lay them, as to their colour, form, bigness, age, and the different way of dressing them: those most used in food are hens eggs; of which, such as are new-laid are best.

As to the preservation of eggs, it is observed that the egg is always quite full when it is first laid by the hen; but from that time it gradually becomes less and less so, to its decay: and however compact and close its shell may appear, it is nevertheless perforated with a multitude of small holes, though too minute for the discernment of our eyes, the effect of which is a daily decrease of matter within the egg, from the time of its being laid; and the perspiration is much quicker in hot weather than in cold.

To preserve the egg fresh, there needs no more than to preserve it full, and stop its transpiration; the method of doing which is, by stopping up those pores with matter which is not soluble in watery fluids: and on this principle it is, that all kinds of varnish, prepared with spirit of wine, will preserve eggs fresh for a long time, if they are carefully rubbed all over the shell: tallow, or mutton fat, is also good for this purpose; for such as are rubbed over with this, will keep as long as those coated over with varnish.

Artificial Method of Hatching Eggs. See HATCHING.

EGINA. See ÆGINA.

EGINHART, secretary to the emperor Charles the Great, was a German. He is the most ancient historian of that nation, and wrote very eloquently for a man of the 9th century. It is said, that he insinuated himself so well into the favour of Imma, daughter to Charles the Great, that he obtained from her whatever he desired. Charles the Great, having found out the intrigue, did not do as Augustus, who is thought to have banished Ovid because he believed him to be too much favoured by Julia; for he married the two lovers together, and gave them a fine estate in land.

EGLANTINE, in botany. See ROSA.

EGLON, a king of the Moabites, who oppressed the Israelites for 18 years (Judges iii. 12—14.) Calmet confounds this servitude of the Hebrews with that under Chusan-rushathaim, making it to subsist only eight years, from the year of the world 2591 to 2599; whereas

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Egypt.

whereas this servitude under Eglon lasted 18 years, and commenced in the year of the world 2661, and 62 years after they had been delivered by Othniel from the subjection of Chushan-rushathaim.

EGRA, a town of Bohemia, formerly imperial, but now subject to the house of Austria. It contains a great number of able artificers, and is famous for its mineral waters. Wallenstein, the emperor's general, was assassinated here in 1634. The French became masters of this town in 1741; but afterwards being blocked up, they were forced to capitulate on September 7th, 1743. It is looked upon as a town of the greatest consequence in Bohemia, except Prague. It is seated on a river of the same name, in E. Long. 12. 30. N. Lat. 50. 21.

EGRET, in ornithology, a species of ardea. See ARDEA.

EGYPT, an extensive country of Africa, lying between 30° and 36° of east longitude, and between 21° and 31° of north latitude. It is bounded by the Mediterranean on the north; by the Red-sea and Isthmus of Suez, which divide it from Arabia, on the east; by Abyssinia or Ethiopia, on the south; and by the deserts of Barca and Nubia, on the west; being 600 miles in length from north to south, and from 100 to 200 in breadth from east to west.

I
Different
names.

As a nation, the Egyptians may with justice lay claim to as high antiquity as any in the world. The country was most probably peopled by Mizraim the son of Ham and grandson of Noah.—By its ancient inhabitants it was called *Chemia*, and is still called *Chemi* in the language of the *Copts* or native Egyptians; and this name it is supposed to have received from Ham the son of Noah. In scripture, we find it most generally named *Mizraim*; though in the Psalms it is styled the *land of Ham*.—To us it is best known by the name *Egypt*, the etymology of which is more uncertain.—Some derive it from *Ægyptus*, a supposed king of the country: others say it signifies no more than “the land of the *Copts*”; *Aia* in Greek signifying a country, and *Æcoptos* being easily softened into *Ægyptus*.—The most probable opinion, however, seems to be, that it received this name from the blackness of its soil, and the dark colour both of its river and inhabitants: for such a blackish colour is by the Greeks called *ægyptios* from *gyps*, and *ægypt* “a vulture;” and by the Latins, *subvulturius*. For the same reason, other names of a similar import have been given to this country by the Greeks; such as *Aeria*, and *Melambolus*: the river itself was called *Melo* or *Melas*; by the Hebrews, *Shihor*; and by the Ethiopians, *Siris*; all of which signify “black.”

Ancient Egypt is by some divided into two parts, the Upper and Lower Egypt: by others into three, the Upper Egypt, properly so called, or *Thebais*; the Middle Egypt, or *Heptanomis*; and the Lower Egypt, the best part of which was the *Delta*, or that space encompassed by the branches of the Nile. See THEBAIS, &c.

The Egyptians, like the Chinese, pretend to an excessive antiquity, pretending to have records for ten, twenty, or even fifty thousand years. Thus their history is so much involved in obscurity and fable, that for many ages it must be passed over in silence.—The first mortal king whom the Egyptians own to have reigned in that country, was *Menes* or *Menas*. At

what time he reigned, it would be to very little purpose to inquire. He had been preceded, however, by a set of immortals, who it seems left him the kingdom in a very bad situation: for the whole country, except Thebais, was a morass; the people also were entirely destitute of religion, and every kind of knowledge which could render their life comfortable and happy. Menes diverted the course of the Nile, which before that time had washed the foot of a sandy mountain near the borders of Libya, built the city of Memphis, instructed his subjects, and did other things of a similar kind which are usually attributed to the founders of kingdoms.

From the time of Menes, the Egyptian chronology is filled with a list of 330 kings, who reigned 1400 years, but did nothing worthy of notice.—The first distinct piece of history we find concerning Egypt, is the irruption of the *Shepherds*, by whom the country was subdued; but whether this revolution happened during the vast interval of indolence above mentioned, or before or after, cannot be known. The affair is thus related by Manetho. It happened, in the reign of Timaus king of Egypt, that God being displeased with the Egyptians, they suffered a great revolution: for a multitude of men, ignoble in their race, took courage, and, pouring from the east into Egypt, made war with the inhabitants; who submitted to them without resistance. The shepherds, however, behaved with the greatest cruelty; burnt the cities, threw down the temples of the gods, and put to death the inhabitants, carrying the women and children into captivity. This people came from Arabia, and were called *Hycsos*, or *king-shepherds*. They held Egypt in subjection for 259 years; at the end of which period, they were obliged by a king of Upper Egypt, named *Aonosis*, or *Thebmosis*, to leave the country. This prince's father had, it seems, gained great advantages over them, and shut them up in a place called *Abaris*, or *Avaris*, containing 10,000 acres of land. Here they were closely besieged by Amosis, with an army of 400,000 men; but at last the king, finding himself unable to reduce them by force, proposed an agreement, which was readily accepted. In consequence of this agreement, the shepherds withdrew from Egypt with their families, to the number of 240,000; and, taking the way of the desert, entered Syria: but fearing the Assyrians, who were then very powerful, and masters of Asia, they entered the land of Judæa, and built there a city capable of holding so great a multitude, and called it *Jerusalem*.

According to Mr Bruce, the shepherds who invaded Egypt were no other than the inhabitants of Barbary. They were, he says, *carriers* to the Cushites who lived farther to the south. The latter had built the many stately temples in Thebes and other cities of Egypt; though, according to him, they had no dwelling-places but holes or caves in the rocks. Being a commercial people, they remained at home collecting and preparing their articles, which were dispersed by the *barabers* or shepherds already mentioned. These, from the nature of their employment, lived in moveable habitations, as the Tartars do at this day. By the Hebrews, he tells us, they were called *phut*, but *shepherds* by every other people; and from the name *baraber*, the word *Barbary* is derived. By their employment, which was the dispersing the Arabian and African goods all over

Egypt.

over the continent, they had become a great and powerful people; and from their opposite dispositions and manners, became very frequently enemies to the Egyptians. To one Salatis our author ascribes the destruction of Thebes in Upper Egypt, so much celebrated by Homer for its magnificence. But this certainly cannot be the case; for Homer wrote long after the time of Joseph: and we find that even then the Egyptians had the shepherds in abhorrence, in all probability because they had been grievously oppressed by them. Mr Bruce counts three invasions of these people; the first, that of Salatis already mentioned, who overthrew the first dynasty of Egyptian kings from Menes, and destroyed Thebes: the second was that of Sabacco or So; for according to him this was not the name of a single prince, but of a people, and signifies *shepherds*: and the third, after the building of Memphis, where 240,000 of them were besieged as above mentioned. But accounts of this kind are evidently inconsistent in the highest degree; for how is it possible that the *third* invasion, antecedent to the building of Jerusalem, could be posterior to the *second*, if the latter happened only in the days of Hezekiah?

In these early ages, however, it would seem that the kingdom of Egypt had been very powerful and its dominion very widely extended; since we find it said, that the *Babirians* revolted from Osymandyas, another Egyptian king of very high antiquity, and of whose wealth the most marvellous accounts are given.

After an unknown interval of time from this monarch, reigned Sesostris. He was the first great warrior whose conquests are recorded with any degree of distinctness. In what age of the world he lived, is uncertain. Some chronologers, among whom is Sir Isaac Newton, are of opinion, that he is the Sefac or Shishak, who took Jerusalem in the reign of Rehoboam the son of Solomon. Others, however, place him much earlier; and Mr Whiston will have him to be the Pharaoh who refused to part with the Israelites, and was at last drowned in the Red Sea. Mr Bryant endeavours to prove that no such person ever existed; but that in his history, as well as that of many ancient heroes, we have an abridgement of that of the Cushites or Babylonians, who spread themselves over great part of the known world, and every where brought the people in subjection to them. His reign is reckoned the most extraordinary part of the Egyptian history; and the following seems to be the least fabulous account that can be got of it. The father of Sesostris was told in a dream, by the god Vulcan, that his son, who was then newly born, or perhaps still unborn, should be lord of the whole earth. His father, upon the credit of this vision, got together all the males in the land of Egypt that were born on the same day with Sesostris; appointed nurses and proper persons to take care of them, and had them treated like his own child; being persuaded that they who had been the constant companions of his youth would prove the most faithful ministers and soldiers. As they grew up, they were inured to laborious exercises; and, in particular, were never permitted to taste any food till they had performed a course of 180 furlongs, upwards of 22 of our miles. When the old king imagined they were sufficiently educated in the martial way he designed them to follow, they were sent by way

N^o 110.

of trial of their abilities against the Arabians. In this expedition Sesostris proved successful, and in the end subdued that people who had never before been conquered. He was sent to the westward, and conquered the greatest part of Africa; nor could he be stopped in his career till he arrived at the Atlantic ocean. Whilst he was on this expedition, his father died; and then Sesostris resolved to fulfil the prediction of Vulcan, by actually conquering the whole world. As he knew that this must take up a long time, he prepared for his journey in the best manner possible. The kingdom he divided into 36 provinces, and endeavoured to secure the affections of the people by gifts both of money and land. He forgave all who had been guilty of offences, and discharged the debts of all his soldiers. He then constituted his brother Arais the supreme regent; but forbade him to use the diadem, and commanded him to offer no injury to the queen or her children, and to abstain from the royal concubines. His army consisted of 600,000 foot, 24,000 horse, and 27,000 chariots. Besides these land-forces, he had at sea two mighty fleets; one, according to Diodorus, of 400 sail. Of these fleets, one was designed to make conquests in the west, and the other in the east; and therefore the one was built on the Mediterranean and the other on the Red Sea. The first of these conquered Cyprus, the coast of Phœnicia, and several of the islands called *Cyclades*: the other conquered all the coasts of the Red Sea; but its progress was stopped by shoals and difficult places which the navigators could not pass, so that he seems not to have made many conquests by sea.

With the land-forces Sesostris marched against the Ethiopians and Troglodites; whom he overcame, and obliged them to pay him a tribute of gold, ebony, and ivory. From thence he proceeded as far as the promontory of Dira, which lay near the straits of Babel-mandel, where he set up a pillar with an inscription in sacred characters. He then marched on to the country where cinnamon grows, or at least to some country where cinnamon at that time was brought, probably some place in India; and here he in like manner set up pillars, which were to be seen for many ages after. As to his farther conquests, it is agreed by almost all authors of antiquity, that he over-ran and pillaged the whole continent of Asia, and some part of Europe. He crossed the Ganges, and erected pillars on its banks; and from thence he is said to have marched eastward to the very extremity of the Asiatic continent. Returning from thence, he invaded the Scythians and Thracians; but all authors do not agree that he conquered them. Some even affirm, that he was overthrown by them with great slaughter, and obliged to abandon a great part of his booty and military stores. But whether he had good or bad success in these parts, it is a common opinion that he settled a colony in Colchis. Herodotus, however, who gives the most particular account of the conquests of this monarch, does not say whether the colony was designedly planted by Sesostris; or whether part of his army loitered behind the rest, and took up their residence in that region. From his own knowledge, he asserts, that the inhabitants of that country were undoubtedly of Egyptian descent. This was evident from the personal resemblance they bore to the Egyptians,

tians,

Egypt

tians, who were swarthy-complexioned and frizzle-haired; but more especially from the conformity of their customs, particularly circumcision.

The utmost boundary of this mighty monarch's conquests, however, was in the country of Thrace; for beyond this country his pillars were no where to be seen. These pillars he was accustomed to set up in every country which he conquered, with the following inscription, or one to the same purpose: "Sesostris, king of kings, and lord of lords, subdued this country by the power of his arms." Besides these, he left also statues of himself; two of which, according to Herodotus, were to be seen in his time; the one on the road between Ephesus and Phocæa, and the other between Smyrna and Sardis: they were armed after the Ethiopian and Egyptian manner, holding a javelin in one hand and a bow in the other. Across the breast they had a line drawn from one shoulder to the other, with the following inscription; "This region I obtained by these my shoulders." They were mistaken for images of Memnon.

3

Returns to Egypt.

The reasons given by Sesostris for his returning into Egypt from Thrace, and thus leaving the conquest of the world unfinished, were the want of provisions for his army, and the difficulty of the passes. Most probably, however, his return was hastened by the intelligence he received from the high priest of Egypt, concerning the rebellious proceedings of his brother; who, encouraged by his long absence, had assumed the diadem, violated the queen, and also the royal concubines. On receiving this news, Sesostris hastened from Thrace; and at the end of nine years came to Pelusium in Egypt, attended by an innumerable multitude of captives taken from many different nations, and loaded with the spoils of Asia. The treacherous brother met him at this city; and it is said, with very little probability, that Sesostris accepted of an invitation to an entertainment from him. At this he drank freely, together with the queen and the rest of the royal family. During the continuance of the entertainment, Armais caused a great quantity of dried reeds to be laid round the apartment where they were to sleep; and as soon as they were retired to rest set fire to the reeds. Sesostris perceiving the danger he was in, and that his guards, overcharged with liquor, were incapable of assisting him, rushed through the flames, and was followed by his wife and children. In thanksgiving for this wonderful deliverance, he made several donations to the gods, particularly to Vulcan the god of fire. He then took vengeance on his brother Armais, said to be the Danaus of the Greeks, who, being on this occasion driven out of Egypt, withdrew into Greece.

4

His great works.

Sesostris now laid aside all thoughts of war, and applied himself wholly to such works as might tend to the public good, and his own future reputation. In order to prevent the incursions of the Syrians and Arabians, he fortified the east side of Egypt with a wall which ran from Pelusium through the desert to Heliopolis, for 187½ miles. He raised also an incredible number of vast and lofty mounts of earth, to which he removed such towns as had before been situated too low, in order to secure them from the inundations of the Nile. All the way from Memphis to the sea he dug canals which branched out from the Nile; and not

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only made an easier communication between different places, but rendered the country in a great measure impassable to any enemy. He erected a temple in every city in Egypt, and dedicated it to the supreme deity of the place; but in the course of such a great undertaking as this necessarily must have been, he took care not to employ any of his Egyptian subjects. Thus he secured their affection, and employed the vast multitude of captives he had brought along with him; and to perpetuate the memory of a transaction so remarkable, he caused to be inscribed on all these temples, "No one native laboured hereon." In the city of Memphis, before the temple of Vulcan, he raised six gigantic statues, each of one stone. Two of them were 30 cubits high, representing himself and his wife; the other four were 20 cubits each, and represented his four sons. These he dedicated to Vulcan in memory of his above mentioned deliverance. He raised also two obelisks of marble 120 cubits high, and charged them with inscriptions, denoting the greatness of his power, his revenues, &c.

The captives taken by Sesostris are said to have been treated with the greatest barbarity; so that at last they resolved at all events to deliver themselves from a servitude so intolerable. The Babylonians particularly were concerned in this revolt, and laid waste the country to some extent; but being offered a pardon and a place to dwell in, they were pacified, and built for themselves a city which they called *Babylon*. Towards the conquered princes who waited on him with their tribute, the Egyptian monarch behaved with unparalleled insolence. On certain occasions he is said to have unharnessed his horses, and, yoking kings together, made them draw his chariot. One day, however, observing one of the kings who drew his chariot to look back upon the wheels with great earnestness, he asked what made him look so attentively at them? The unhappy prince replied, "O king, the going round of the wheel puts me in mind of the vicissitudes of fortune: for as every part of the wheel is uppermost and lowermost by turns, so it is with men; who one day sit on a throne, and on the next are reduced to the vilest degree of slavery." This answer brought the insulting conqueror to his senses; so that he gave over the practice, and thenceforth treated his captives with great humanity. At length this mighty monarch lost his sight, and laid violent hands on himself.

5 His death.

After the death of Sesostris, we meet with another chasm of an indeterminate length in the Egyptian history. It concludes with the reign of Amasis or Ammosis; who being a tyrant, his subjects joined Acisanes the king of Ethiopia to drive him out.—Thus Acisanes became master of the kingdom; and after his death follows another chasm in the history, during which the empire is said to have been in a state of anarchy for five generations.—This period brings us down to the times of the Trojan war. The reigning prince in Egypt was at that time called *Cetes*; by the Greeks, *Proteus*. The priests reported that he was a magician; and that he could assume any shape he pleased, even that of fire. This fable, as told by the Greeks, drew its origin from a custom among the Egyptians, perhaps introduced by Proteus. They were used to adorn and distinguish the heads of their kings with the representations of animals or vegetables, or

6 Origin of the fable of Proteus.

3 A

even

Egypt.

7
Arrival of
Paris and
Helen in
Egypt.

even with burning incense, in order to strike the beholders with the greater awe. Whilst Proteus reigned, Paris or Alexander, the son of Priam king of Troy, was driven by a storm on the coast of Egypt, with Helen, whom he was carrying off from her husband. But when the Egyptian monarch heard of the breach of hospitality committed by Paris, he seized him, his mistress, and companions, with all the riches he had brought away with him from Greece. He detained Helen, with all the effects belonging to Menelaus her husband, promising to restore them to the injured party whenever they were demanded; but commanded Paris and his companions to depart out of his dominion in three days, on pain of being treated as enemies. In what manner Paris afterwards prevailed upon Proteus to restore his mistress, we are not told; neither do we know any thing further of the transactions of this prince's reign nor of his successors, except what has entirely the air of fable, till the days of Sabbaco the Ethiopian, who again conquered this kingdom. He began his reign with an act of great cruelty, causing the conquered prince to be burnt alive: nevertheless, he no sooner saw himself firmly established on the throne of Egypt, than he became a new man; so that he is highly extolled for his mercy, clemency, and wisdom. He is thought to have been the *So* mentioned in scripture, and who entered into a league with Hoshea king of Israel against Shalmaneser king of Assyria. He is said to have been excited to the invasion of Egypt by a dream or vision, in which he was assured, that he should hold that kingdom for 50 years. Accordingly, he conquered Egypt, as had been foretold; and at the expiration of the time above mentioned, he had another dream, in which the tutelar god of Thebes acquainted him, that he could no longer hold the kingdom of Egypt with safety and happiness, unless he massacred the priests as he passed through them with his guards. Being haunted with this vision, and at the same time abhorring to hold the kingdom on such terms, he sent for the priests, and acquainted them with what seemed to be the will of the gods. Upon this it was concluded, that it was the pleasure of the Deity that Sabbaco should remain no longer in Egypt; and therefore he immediately quitted that kingdom, and returned to Ethiopia.

8
Egypt con-
quered by
Sabbaco.

9
Remark-
able story
of Sethon.

Of *Anyfas*, who was Sabbaco's immediate successor, we have no particulars worth notice. After him reigned one Sethon, who was both king and priest of Vulcan. He gave himself up to religious contemplation; and not only neglected the military class, but deprived them of their lands. At this they were so much incensed, that they entered into an agreement not to bear arms under him; and in this state of affairs Sennacherib king of Assyria arrived before Pelusium with a mighty army. Sethon now applied to his soldiers, but in vain: they unanimously persisted in refusing to march under his banner. Being therefore destitute of all human aid, he applied to the god Vulcan, and requested him to deliver him from his enemies. Whilst he was yet in the temple of that god, it is said he fell into a deep sleep; during which, he saw Vulcan standing at his side, and exhorting him to take courage. He promised, that if Sethon would but go out against the Assyrians, he should obtain a complete victory over them. Encouraged by this assurance, the king assem-

bled a body of artificers, shop-keepers, and labourers; and, with this undisciplined rabble, marched towards Pelusium. He had no occasion, however, to fight; for the very night after his arrival at Pelusium, an innumerable multitude of field-rats entering the enemies' camp, gnawed to pieces the quivers, bowstrings, and shield-straps. Next morning, when Sethon found the enemy disarmed, and on that account beginning to fly, he pursued them to a great distance, making a terrible slaughter. In memory of this extraordinary event, a statue of Sethon was erected in the temple of Vulcan, holding in one hand a rat, and delivering these words: "Whosoever beholdeth me, let him be pious."

Soon after the death of Sethon, the form of government in Egypt was totally changed. The kingdom was divided into twelve parts, over which as many of the chief nobility presided. This division, however, subsisted but for a short time. Psammitichus, one of the twelve, dethroned all the rest, 15 years after the division had been made. The history now begins to be divested of fable; and from this time may be accounted equally certain with that of any other nation. The vast conquests of Sesostris were now no longer known; for Psammitichus possessed no more than the country of Egypt itself. It appears, indeed, that none of the successors of Sesostris, or even that monarch himself, had made use of any means to keep in subjection the countries he had once conquered. Perhaps, indeed, his design originally was rather to *pillage* than to conquer; and therefore, on his return, his vast empire vanished at once. Psammitichus, however, endeavoured to extend his dominions by making war on his neighbours; but by putting more confidence in foreign auxiliaries than in his own subjects, the latter were so much offended, that upwards of 200,000 fighting men emigrated in a body, and took up their residence in Ethiopia.—To repair this loss, Psammitichus earnestly applied himself to the advancement of commerce; and opened his ports to all strangers, whom he greatly caressed, contrary to the cruel maxims of his predecessors, who refused to admit them into the country. He also laid siege to the city of Azotus in Syria, which held out for 29 years against the whole strength of the kingdom; from which we may gather, that, as a warrior, Psammitichus was by no means remarkable. He is reported to have been the first king of Egypt that drank wine. He also sent to discover the springs of the Nile; and is said to have attempted to discover the most ancient nation in the world by the following method. Having procured two newly born children, he caused them to be brought up in such a manner that they never heard a human voice. He imagined that these children would naturally speak the original language of mankind: therefore, when, at two years of age, they pronounced the Phrygian word *beccos* (or some sound resembling it), which signifies bread, he concluded that the Phrygians were the most ancient people in the world.

Nechus, the son and successor of Psammitichus, is the *Pharaoh-Necho* of scripture, and was a prince of an enterprising and warlike genius. In the beginning of his reign, he attempted to cut through the isthmus of Suez, between the Red Sea and the Mediterranean; but, through the invincible obstacles which nature has thrown in the way of such undertakings, he was obli-

Egypt.

10
Reign of
Psammitichus.

11
Succeeded
by Nechus.

ged.

Egypt. ged to abandon the enterprize, after having lost 120,000 men in the attempt. After this he sent a ship, manned with some expert Phœnician mariners, on a voyage to explore the coasts of Africa. Accordingly, they performed the voyage; failed round the continent of Africa; and after three years returned to Egypt, where their relation was deemed incredible.

12
His wars
with Josiah
and Nebu-
chadnezzar.

The most remarkable wars in which this king was engaged, are recorded in the sacred writings. He went out against the king of Assyria, by the divine command, as he himself told Josiah; but being opposed by this king of Judæa, he defeated and killed him at Megiddo; after which he set up, in that country, king Jehoiakim, and imposed on him an annual tribute of 100 talents of silver and one talent of gold. He then proceeded against the king of Assyria; and weakened him so much, that the empire was soon after dissolved. Thus he became master of Syria and Phœnicia; but in a short time, Nebuchadnezzar king of Babylon came against him with a mighty army. The Egyptian monarch, not daunted by the formidable appearance of his antagonist, boldly ventured a battle; but was overthrown with prodigious slaughter, and Nebuchadnezzar became master of all the country to the very gates of Pelusium.

13
Apries a
martial and
successful
prince.

The reign of Apries, the *Pharaoh-Hophra* of Scripture, presents us with a new revolution in the Egyptian affairs. He is represented as a martial prince, and in the beginning of his reign very successful. He took by storm the rich city of Sidon; and having overcome the Cypriots and Phœnicians in a sea-fight, returned to Egypt laden with spoil. This success probably incited Zedekiah king of Judæa to enter into an alliance with him against Nebuchadnezzar king of Babylon. The bad success of this alliance was foretold by the prophet Jeremiah; and accordingly it happened. For Nebuchadnezzar having sat down with his army before Jerusalem, Apries marched from Egypt with a design to relieve the city; but no sooner did he perceive the Babylonians approaching him, than he retreated as fast as he could, leaving the Jews exposed to the rage of their merciless enemies; who were thereupon treated as Jeremiah had foretold; and by this step Apries brought upon himself the vengeance denounced by the same prophet.—The manner in which these predictions were fulfilled is as follows: The Cyreneans, a colony of the Greeks, being greatly strengthened by a numerous supply of their countrymen under their third king *Battus* styled the *Happy*, and encouraged by the Pythian oracle, began to drive out their Libyan neighbours, and share their possessions among themselves. Hereupon Andican king of Libya sent a submissive embassy to Apries, and implored his protection against the Cyreneans. Apries complied with his request, and sent a powerful army to his relief. The Egyptians were defeated with great slaughter; and those who returned complained that the army had been sent off by Apries in order to be destroyed, and that he might tyrannize without controul over the remainder of his subjects. This thought catching the attention of the giddy multitude, an almost universal defection ensued. Apries sent one Amasis, a particular friend, in whom he thought he could confide, to bring back his people to a sense of their duty. But by this friend he was betrayed; for Amasis, taking the op-

14
Bad consequences of
his alliance
with Zedekiah.

15
His subjects
revolt.

portunity of the present ferment, caused himself to be proclaimed king. Apries then dispatched one Patarbemis, with orders to take Amasis, and bring him alive before him. This he found impossible, and therefore returned without his prisoner; at which the king was so enraged, that he commanded Patarbemis's nose and ears to be cut off. This piece of cruelty completed his ruin; for when the rest of the Egyptians who continued faithful to Apries beheld the inhuman mutilation of so worthy and noble a person as Patarbemis was, they to a man deserted Apries, and went over to Amasis.

Both parties now prepared for war; the usurper having under his command the whole body of native Egyptians; and Apries only those Ionians, Carians, and other mercenaries whom he could engage in his service. The army of Apries amounted only to 30,000; but, though greatly inferior in number to the troops of his rival, as he well knew that the Greeks were much superior in valour, he did not doubt of victory. Nay, so far was Apries puffed up with this notion, that he did not believe it was in the power even of any God to deprive him of his kingdom. The two armies soon met, and drew up in order of battle near Memphis. A bloody engagement ensued; in which, though the army of Apries behaved with the greatest resolution, they were at last overpowered with numbers, and utterly defeated, the king himself being taken prisoner. Amasis now took possession of the throne without opposition. He confined Apries in one of his palaces, but treated him with great care and respect. The people, however, were implacable, and could not be satisfied while he enjoyed his life. Amasis, therefore, at last found himself obliged to deliver him into their hands. Thus the prediction received its final completion: Apries was delivered up to those *who sought his life*; and who no sooner had him in their power, than they strangled him, and laid his body in the sepulchre of his ancestors.

16
Apries de-
feated and
taken pri-
soner by
Amasis.

During these intestine broils, which must have greatly weakened the kingdom, it is probable that Nebuchadnezzar invaded Egypt. He had been for 13 years before this employed in besieging Tyre, and at last had nothing but an empty city for his pains. To make himself some amends, therefore, he entered Egypt, miserably harassed the country, killed and carried away great numbers of the inhabitants, so that the country did not recover from the effects of this incursion for a long time after. In this expedition, however, he seems not to have aimed at any permanent conquest, but to have been induced to it merely by the love of plunder, and of this he carried with him an immense quantity to Babylon.

17
Egypt in-
vaded by
Nebuchad-
nezzar.

During the reign of Amasis, Egypt is said to have been perfectly happy, and to have contained 20,000 populous cities. That good order might be kept among such vast numbers of people, Amasis enacted a law, by which every Egyptian was bound once a-year to inform the governor of his province by what means he gained his livelihood; and if he failed of this, to put him to death. The same punishment he decreed to those who could not give a satisfactory account of themselves.

18
Happy ad-
ministra-
tion of
Amasis.

This monarch was a great favourer of the Greeks, and married a woman of Grecian extract. To many

Egypt.

Greek cities, as well as particular persons, he made considerable presents. Beside these, he gave leave to the Greeks in general to come into Egypt, and settle either in the city of Naucratis, or carry on their trade upon the sea-coasts; granting them also temples, and places where they might erect temples to their own deities. He received also a visit from Solon the celebrated Athenian lawgiver, and reduced the island of Cyprus under his subjection.

19
Offends
Cambyfes
king of
Persia,

This great prosperity, however, ended with the death of Amasis, or indeed before it. The Egyptian monarch had some how or other incensed Cambyfes king of Persia. The cause of the quarrel is uncertain; but whatever it was, the Persian monarch vowed the destruction of Amasis. In the mean time *Phanes* of Halicarnassus, commander of the Grecian auxiliaries in the pay of Amasis, took some private disgust; and leaving Egypt, embarked for Persia. He was a wise and able general, perfectly well acquainted with every thing that related to Egypt; and had great credit with the Greeks in that country. Amasis was immediately sensible how great the loss of this man would be to him, and therefore sent after him a trusty eunuch with a swift galley. *Phanes* was accordingly overtaken in Lycia, but not brought back; for, making his guard drunk, he continued his journey to Persia, and presented himself before Cambyfes, as he was meditating the destruction of the Egyptian monarchy.

20
And Poly-
crates ty-
rant of
Samos.

At this dangerous crisis also, the Egyptian monarch imprudently made Polycrates the tyrant of Samos his enemy. This man had been the most remarkable perhaps of any recorded in history, for an uninterrupted course of success, without the intervention of one single unfortunate event. Amasis, who was at this time in strict alliance with Polycrates, wrote him a letter, in which, after congratulating him on his prosperity, he told him that he was afraid lest his successes were too many, and he might be suddenly thrown down into the greatest misery. For this reason he advised him voluntarily to take away something from his own happiness; and to cast away that which would grieve him most if he was accidentally to lose it. Polycrates followed his advice, and threw into the sea a signet of inestimable value. This, however, did not answer the intended purpose. The signet happened to be swallowed by a fish, which was taken a few days afterwards, and thus was restored to Polycrates. Of this Amasis was no sooner informed, than, considering Polycrates as really *unhappy*, and already on the brink of destruction, he resolved to put an end to the friendship which subsisted between them. For this purpose he dispatched an herald to Samos, commanding him to acquaint Polycrates, that he renounced his alliance, and all the obligations between them; that he might not mourn his misfortunes with the sorrow of a friend. Thus Amasis left Polycrates at liberty to act against him, if he chose to do so; and accordingly he offered to assist Cambyfes with a fleet of ships in his Egyptian expedition.

21
Egypt in-
vaded by
Cambyfes.

Amasis had not, however, the misfortune to see the calamities of his country. He died about 525 years before Christ, after a reign of 44 years; and left the kingdom to his son Psammenitus, just as Cambyfes was approaching the frontiers of the kingdom. The new prince was scarce seated on the throne, when the Per-

sians appeared. Psammenitus drew together what forces he could, in order to prevent them from entering the kingdom. Cambyfes, however, immediately laid siege to Pelusium, and made himself master of it by the following stratagem: he placed in the front of his army a great number of cats, dogs, and other animals that were deemed sacred by the Egyptians. He then attacked the city, and took it without opposition; the garrison, which consisted entirely of Egyptians, not daring to throw a dart or shoot an arrow against their enemies, lest they should kill some of the holy animals.

Cambyfes had scarce taken possession of the city, when Psammenitus advanced against him with a numerous army. But before the engagement, the Greeks who served under Psammenitus, to show their indignation against their treacherous countryman *Phanes*, brought his children into the camp, killed them in the presence of their father and of the two armies, and then drank their blood. The Persians, enraged at so cruel a sight, fell upon the Egyptians with the utmost fury, put them to flight, and cut the greatest part of them in pieces. Those who escaped fled to Memphis, where they were soon after guilty of a horrid outrage. Cambyfes sent a herald to them in a ship from Mitylene: but no sooner did they see her come into the port, than they flocked down to the shore, destroyed the ship, and tore to pieces the herald and all the crew; afterwards carrying their mangled limbs into the city, in a kind of barbarous triumph. Not long after, they were obliged to surrender; and thus Psammenitus fell into the hands of his inveterate enemy, who was now enraged beyond measure at the cruelties exercised upon the children of *Phanes*, the herald, and the Mitylenean sailors.

The rapid success of the Persians struck with such terror the Libyans, Cyreneans, Barcæans, and other dependents or allies of the Egyptian monarch, that they immediately submitted. Nothing now remained but to dispose of the captive king, and revenge on him and his subjects the cruelties which they had committed. This the merciless victor executed in the severest manner. On the 10th day after Memphis had been taken, Psammenitus and the chief of the Egyptian nobility were ignominiously sent into one of the suburbs of that city. The king being there seated in a proper place, saw his daughter coming along in the habit of a poor slave with a pitcher to fetch water from the river, and followed by the daughters of the greatest families in Egypt, all in the same miserable garb, with pitchers in their hands, drowned in tears, and loudly bemoaning their miserable situation. When the fathers saw their daughters in this distress, they burst into tears, all but Psammenitus, who only cast his eyes on the ground and kept them fixed there. After the young women, came the son of Psammenitus, with 2000 of the young nobility, all of them with bits in their mouths and halters round their neck, led to execution. This was done to expiate the murder of the Persian herald and the Mitylenean sailors; for Cambyfes caused ten Egyptians of the first rank to be publicly executed for every one of those that had been slain. Psammenitus, however, observed the same conduct as before, keeping his eyes stedfastly fixed on the ground, though all the Egyptians around him made the loudest lamentations.

Egypt.

22
Cruelty and
defeat of
the Egyp-
tians.

23
Their
dreadful
punishment
by Camby-
fes.

Egypt

tions. A little after this he saw an intimate friend and companion, now advanced in years, who having been plundered of all he had, was begging his bread from door to door in the suburbs. As soon as he saw this man, Psammenitus wept bitterly; and calling out to him by his name, struck himself on the head as if he had been frantic. Of this the spies who had been set over him to observe his behaviour, gave immediate notice to Cambyfes, who thereupon sent a messenger to inquire the cause of such immoderate grief. Psammenitus answered, That the calamities of his own family confounded him, and were too great to be lamented by any outward signs of grief; but the extreme distress of a bosom friend gave more room for reflection, and therefore extorted tears from him. With this answer Cambyfes was so affected, that he sent orders to prevent the execution of the king's son; but these came too late, for the young prince had been put to death before any of the rest. Psammenitus himself was then sent for into the city, and restored to his liberty: and had he not showed a desire of revenge, might perhaps have been trusted with the government of Egypt; but being discovered hatching schemes against the government, he was seized, and condemned to drink bull's blood.

24
Egypt becomes a province of the Persian and afterwards of the Grecian empire.

The Egyptians were now reduced to the lowest degree of slavery. Their country became a province of the Persian empire: the body of Amasis their late king was taken out of his grave; and after being mangled in a shocking manner, was finally burnt. But what seemed more grievous than all the rest, their god Apis was slain, and his priests ignominiously scourged; and this inspired the whole nation with such an hatred to the Persians, that they could never afterwards be reconciled to them. As long as the Persian empire subsisted, the Egyptians could never shake off their yoke. They frequently revolted indeed, but were always overthrown with prodigious loss. At last they submitted, without opposition, to Alexander the Great: after his death, Egypt again became a powerful kingdom; though since the conquest of it by Cambyfes to the present time, it hath never been governed but by foreign princes, agreeable to the prophecy of Ezekiel, "There shall be no more a prince of the land of Egypt."

25
Assigned to Ptolemy Lagus, who assumes the title of king.

On the death of Alexander the Great, Egypt, together with Libya, and that part of Arabia which borders on Egypt, were assigned to Ptolemy Lagus as governor under Alexander's son by Roxana, who was but newly born. Nothing was farther from the intention of this governor, than to keep the provinces in trust for another. He did not, however, assume the title of king, till he perceived his authority so firmly established that it could not be shaken; and this did not happen till 19 years after the death of Alexander, when Antigonus and Demetrius had unsuccessfully attempted the conquest of Egypt.

From the time of his first establishment on the throne, Ptolemy, who had assumed the title of *Soter*, reigned 20 years; which added to the former 19, make up the 39 years which historians commonly allow him to have reigned alone.—In the 39th year of his reign, he made one of his sons, named *Philadelphus*, partner in the empire; declaring him his successor, to the prejudice of his eldest son named *Ceraunus*; being excited thereto by

his violent love for *Berenice* *Philadelphus's* mother. When the succession was thus settled, *Ceraunus* immediately quitted the court; and fled at last into Syria, where he was received with open arms by *Seleucus Nicator*, whom he afterwards murdered.

The most remarkable transaction of this reign was the embellishing of the city of Alexandria, which Ptolemy made the capital of his new kingdom, and of which an account is given under the article *ALEXANDRIA*. About 284 years before Christ, died Ptolemy Soter, in the 41st year of his reign, and 84th of his age. He was the best prince of his race; and left behind him an example of prudence, justice, and clemency which few of his successors chose to follow. Besides the provinces originally assigned to him, he has added to his empire those of *Cælo-Syria*, *Ethiopia*, *Pamphylia*, *Lycia*, *Caria*, and some of the *Cyclades*. His successor, Ptolemy Philadelphus, added nothing to the extent of the empire; nor did he perform any thing worthy of notice except embellishing further the city of Alexandria, and entering into an alliance with the Romans. In his time, one *Magas*, the governor of *Libya* and *Cyrene*, revolted; and held these provinces as an independent prince, notwithstanding the utmost efforts of Ptolemy to reduce him. At last an accommodation took place; and a marriage was proposed between *Berenice*, the only daughter of *Magas*, and Ptolemy's eldest son. The young princess was to receive all her father's dominions by way of dowry, and thus they would again be brought under the dominion of Ptolemy's family. But before this treaty could be put in execution, *Magas* died; and then *Apamea*, the princess's mother, did all she could to prevent the match. This, however, she was not able to do; tho' her efforts for that purpose produced a destructive war of four years continuance with *Antiochus Theus* king of Syria, and the acting of a cruel tragedy in the family of the latter. See *SYRIA*.

26
Succeeded by Philadelphus.

About 246 years before Christ, Ptolemy Philadelphus died; and was succeeded by his eldest son Ptolemy, who had been married to *Berenice* the daughter of *Magas*, as above related. In the beginning of his reign, he found himself engaged in a war with *Antiochus Theus* king of Syria. From this he returned victorious, and brought with him 2500 statues and pictures, among which were many of the ancient Egyptian idols, which had been carried away by Cambyfes into Persia. These were restored by Ptolemy to their ancient temples: in memory of which favour, the Egyptians gave him the surname of *Euergetes*, or the Beneficent. In this expedition he greatly enlarged his dominions, making himself master of all the countries that lie between mount *Taurus* and the confines of *India*. An account of these conquests was given by himself, inscribed on a monument, to the following effect. "Ptolemy Euergetes, having received from his father the sovereignty of Egypt, Libya, Syria, Phænice, Cyprus, Lycia, Caria, and the other *Cyclades*, assembled a mighty army of horse and foot, with a great fleet, and elephants, out of *Trogloditia* and *Ethiopia*; some of which had been taken by his father, and the rest by himself, and brought from thence, and trained up for war; with this great force he sailed into Asia; and having conquered all the provinces which lie on this side the *Euphrates*, *Cilicia*, *Pamphylia*, *Ionia*, the *Hellepont*,

27
Ptolemy Euergetes great conqueror.

Egypt.

Hellefpont, and Thrace, he croſſed that river with all the forces of the conquered countries, and the kings of thoſe nations, and reduced Meſopotamia, Babylo-
nia, Suſia, Perſia, Media, and all the country as far as Baſtria.”

On the king's return from this expedition, he paſſed through Jeruſalem, where he offered many ſacrifices to the God of Iſrael, and ever afterwards expreſſed a great favour for the Jewiſh nation. At this time, the Jews were tributaries to the Egyptian monarchs, and paid them annually 20 talents of ſilver. This tribute, however, Onias, who was then high prieſt, being of a very covetous diſpoſition, had for a long time neglected to pay, ſo that the arrears amounted to a very large ſum. Soon after his return, therefore, Ptolemy ſent one of his courtiers named *Athenion* to demand the money, and deſired him to acquaint the Jews that he would make war upon them in caſe of a refusal. A young man, however, named *Joſeph*, nephew to Onias, not only found means to avert the king's anger, but even got himſelf choſen his receiver-general, and by his faithful diſcharge of that important truſt, continued in high favour with Ptolemy as long as he lived.

Ptolemy Euergetes having at laſt concluded a peace with Seleucus the ſucceſſor of Antiochus Theus king of Syria, attempted the enlargement of his dominions on the ſouth ſide. In this he was attended with ſuch ſucceſs, that he made himſelf maſter of all the coaſts of the Red Sea, both on the Arabian and Ethiopians ſides, quite down to the ſtraits of Babel-mandel. On his return he was met by ambaſſadors from the Achæans, imploring his aſſiſtance againſt the Etolians and Lacedæmonians. This the king readily promiſed them: but they having in the mean time engaged Antigonus king of Macedon to ſupport them, Ptolemy was ſo much offended, that he ſent powerful ſuccours to Cleomenes king of Sparta; hoping, by that means, to humble both the Achæans and their new ally Antigonus. In this, however, he was diſappointed; for Cleomenes, after having gained very conſiderable advantages over the enemy, was at laſt entirely defeated in the battle of Sellafia, and obliged to take refuge in Ptolemy's dominions. He was received by the Egyptian monarch with the greateſt demonſtrations of kindneſs; a yearly penſion of 24 talents was aſſigned him, with a promiſe of reſtoring him to the Spartan throne; but before this could be accompliſhed, the king of Egypt died, in the 27th year of his reign, and was ſucceeded by his ſon Ptolemy Philopater.

Thus we have ſeen the Egyptian empire brought to a very great height of power; and had the ſucceeding monarchs been careful to preſerve that ſtrength of empire tranſmitted to them by Euergetes, it is very probable that Egypt might have been capable of holding the balance againſt Rome, and after the deſtruction of Carthage prevented that haughty city from becoming miſtreſs of the world. But after the death of Ptolemy Euergetes, the Egyptian empire, being governed only by weak or vicious monarchs, quickly declined, and from that time makes no conſpicuous figure in hiſtory. Ptolemy Philopater began his reign with the murder of his brother; after which, giving himſelf up to all manner of licentiousneſs, the kingdom fell into a kind of anarchy. Cleomenes the Spartan king ſtill reſided

at court; and being now unable to bear the diſſolute manners which prevailed there, he preſſed Philopater to give him the aſſiſtance he had promiſed for reſtoring him to the throne of Sparta. This he the rather inſiſted upon, becauſe he had received advice that Antigonus king of Macedon was dead, that the Achæans were engaged in a war with the Etolians, and that the Lacedæmonians had joined the latter againſt the Achæans and Macedonians. Ptolemy, when afraid of his brother Magas, had indeed promiſed to aſſiſt the king of Sparta with a powerful fleet, hoping by this means to attach him to his own intereſt: but now when Magas was out of the way, it was determined by the king, or rather his miniſters, that Cleomenes ſhould not be aſſiſted, nor even allowed to leave the kingdom; and this extravagant reſolution produced the deſperate attempt of Cleomenes, of which an account is given in the hiſtory of SPARTA.

Of the diſorders which now enſued in the government, Antiochus king of Syria, ſurnamed *the Great*, took the advantage, and attempted to wreſt from Ptolemy the provinces of Cælo-Syria and Paleſtine. But in this he was finally diſappointed; and might eaſily have been totally driven out of Syria, had not Ptolemy been too much taken up with his debaucheries to think of carrying on the war. The diſcontent occaſioned by this piece of negligence ſoon produced a civil war in his dominions, and the whole kingdom continued in the utmoſt confuſion till his death, which happened in the 17th year of his reign and 37th of his age.

During the reign of Philopater happened a very extraordinary event with regard to the Jews, which is mentioned in the Maccabees*. The king of Egypt, while on his Syrian expedition, had attempted to enter the temple of Jeruſalem; but being hindered by the Jews, he was filled with the utmoſt rage againſt the whole nation. On his return to Alexandria, he reſolved to make thoſe who dwelt in that city feel the firſt effects of his vengeance. He began with publiſhing a decree, which he cauſed to be engraved on a pillar erected for that purpoſe at the gate of his palace, excluding all thoſe who did not ſacrifice to the gods worſhipped by the king. By this means the Jews were debarred from ſuing to him for juſtice, or obtaining his protection when they happened to ſtand in need of it. By the favour of Alexander the Great, Ptolemy Soter and Euergetes, the Jews enjoyed at Alexandria the ſame privileges with the Macedonians. In that metropolis the inhabitants were divided into three ranks or claſſes. In the firſt were the Macedonians, or original founders of the city, and along with them were enrolled the Jews; in the ſecond were the mercenaries who had ſerved under Alexander; and in the third the native Egyptians. Ptolemy now, to be revenged of the Jews, ordered, by another decree, that they ſhould be degraded from the firſt rank, and enrolled among the native Egyptians. By the ſame decree it was enacted, that all of that nation ſhould appear at an appointed time before the proper officers, in order to be enrolled among the common people; that at the time of their inrollment they ſhould have the mark of an ivy leaf, the badge of Bacchus, impreſſed with a hot iron on their faces; that all who were thus marked ſhould be made ſlaves; and, laſtly, that if any one ſhould ſtand out againſt this decree, he ſhould be immediately

Egypt.

28
Cleomenes
king of
Sparta takes
refuge in
Egypt.

29
Ptolemy
Philopater
a cruel ty-
rant.

30
Extraordi-
nary ſtory
concerning
the Jews.
* L. iii. 2,
3, 4, 5.

Egypt.

immediately put to death. That he might not, however, seem an enemy to the whole nation, he declared, that those who sacrificed to his gods should enjoy their former privileges, and remain in the same class. Yet, notwithstanding this tempting offer, 300 only out of many thousand Jews who lived in Alexandria could be prevailed upon to abandon their religion in order to save themselves from slavery.

The apostates were immediately excommunicated by their brethren: and this their enemies construed as done in opposition to the king's order; which threw the tyrant into such a rage, that he resolved to extirpate the whole nation, beginning with the Jews who lived in Alexandria and other cities of Egypt, and proceeding from thence to Judæa and Jerusalem itself. In consequence of this cruel resolution, he commanded all the Jews that lived in any part of Egypt to be brought in chains to Alexandria, and there to be shut up in the Hippodrome, which was a very spacious place without the city, where the people used to assemble to see horse-races and other public diversions. He then sent for Herman master of the elephants; and commanded him to have 500 of these animals ready against the next day, to let loose upon the Jews in the Hippodrome. But when the elephants were prepared for the execution, and the people were assembled in great crowds to see it, they were for that day disappointed by the king's absence. For, having been late up the night before with some of his debauched companions, he did not awake till the time for the shew was over, and the spectators returned home. He therefore ordered one of his servants to call him early on the following day, that the people might not meet with a second disappointment. But when the person awakened him according to his order, the king was not yet returned to his senses; having withdrawn, exceedingly drunk, only a short time before. As he did not remember the order, he therefore fell into a violent passion, and threatened with death the servant who had awakened him; and this caused the shew to be put off till the third day. At last the king came to the Hippodrome attended with a vast multitude of spectators; but when the elephants were let loose, instead of falling upon the Jews, they turned their rage against the spectators and soldiers, and destroyed great numbers of them. At the same time, some frightful appearances which were seen in the air so terrified the king, that he commanded the Jews to be immediately set at liberty, and restored them to their former privileges. No sooner were they delivered from this danger than they demanded leave to put to death such of their nation as had abandoned their religion; and this being granted, they dispatched the apostates without excepting a single man.

31
Ptolemy
Philometor
taken pri-
soner by
Antiochus,
and Phys-
con raised
to the
throne.

Philopater was succeeded by Ptolemy Epiphanes; and he, after a reign of 24 years, by Ptolemy Philometor. In the beginning of his reign, a war commenced with the king of Syria, who had seized on the provinces of Coele-Syria and Palestine in the preceding reign. In the course of this war, Philometor was either voluntarily delivered up to Antiochus or taken prisoner. But however this was, the Alexandrians despairing of his ever being able to recover his liberty, raised to the throne his brother Ptolemy, who took the name of *Euergetes II.* but was afterwards called *Physcon*,

or "the great-bellied," on account of the prominent belly which by his gluttony and luxury he had acquired. He was scarce seated on the throne, however, when Antiochus Epiphanes, returning into Egypt, drove out Physcon, and restored the whole kingdom, except Pelusium, to Philometor. His design was to kindle a war betwixt the two brothers, so that he might have an opportunity of seizing the kingdom for himself. For this reason he kept to himself the city of Pelusium; which being the key of Egypt, he might at his pleasure re-enter the country. But Philometor, apprised of his design, invited his brother Physcon to an accommodation; which was happily effected by their sister Cleopatra. In virtue of this agreement, the brothers were to reign jointly, and to oppose to the utmost of their power Antiochus, whom they considered as a common enemy. On this the king of Syria invaded Egypt with a mighty army, but was prevented by the Romans from conquering it.

Egypt.

32
Philometor
restored,
and reigns
jointly with
his brother.

The two brothers were no sooner freed from the apprehensions of a foreign enemy than they began to quarrel with each other. Their differences soon came to such a height, that the Roman senate interposed. But before the ambassadors employed to inquire into the merits of the cause could arrive in Egypt, Physcon had driven Philometor from the throne, and obliged him to quit the kingdom. On this the dethroned prince fled to Rome, where he appeared meanly dressed, and without attendants. He was very kindly received by the senate; who were so well satisfied of the injustice done him, that they immediately decreed his restoration. He was reconducted accordingly; and, on the arrival of the ambassadors in Egypt, an accommodation between the two brothers was negotiated. By this agreement, Physcon was put in possession of Libya and Cyrene, and Philometor of all Egypt and the island of Cyprus; each of them being declared independent of the other in the dominion allotted to them. The treaty, as usual, was confirmed with oaths and sacrifices, and was broken almost as soon as made. Physcon was dissatisfied with his share of the dominions; and therefore sent ambassadors to Rome, desiring that the island of Cyprus might be added to his other possessions. This could not be obtained by the ambassadors; and therefore Physcon went to Rome in person. His demand was evidently unjust; but the Romans, considering that it was their interest to weaken the power of Egypt as much as possible, without further ceremony adjudged the island to him.

33
Difference
between
the two
brothers de-
cided by
the Roman
senate.

Physcon set out from Rome with two ambassadors; and arriving in Greece on his way to Cyprus, he raised there a great number of mercenaries, with a design to sail immediately to that island and conquer it. But the Roman ambassadors telling him, that they were commanded to put him in possession of it by fair means and not by force, he dismissed his army, and returned to Libya, while one of the ambassadors proceeded to Alexandria. Their design was to bring the two brothers to an interview on the frontiers of their dominions, and there to settle matters in an amicable manner. But the ambassador who went to Alexandria, found Philometor very averse from compliance with the decree of the senate. He put off the ambassador so long, that Physcon sent the other also to Alexandria, hoping that the joint persuasions of the two would in-

34
Island of
Cyprus ad-
judged to
Physcon.

duce.

Egypt.

35
Philometor
refuses to
comply.

duce Philometor to comply. But the king, after entertaining them at an immense charge for 40 days, at last plainly refused to submit, and told the ambassadors that he was resolved to adhere to the first treaty. With this answer the Roman ambassadors departed, and were followed by others from the two brothers. The senate, however, not only confirmed their decree in favour of Physcon, but renounced their alliance with Philometor, and commanded his ambassador to leave the city in five days.

36
Rebellion
against
Physcon.

In the mean time, the inhabitants of Cyrene having heard unfavourable accounts of Physcon's behaviour during the short time he reigned in Alexandria, conceived so strong an aversion against him, that they resolved to keep him out of their country by force of arms. On receiving intelligence of this resolution, Physcon dropped all thoughts of Cyprus for the present; and hastened with all his forces to Cyrene, where he soon got the better of his rebellious subjects, and established himself in the kingdom. His vicious and tyrannical conduct, however, soon estranged from him the minds of his subjects, in such a manner, that some of them entering into a conspiracy against him, fell upon him one night as he was returning to his palace, wounded him in several places, and left him for dead on the spot. This he laid to the charge of his brother Philometor; and as soon as he was recovered, took another voyage to Rome. Here he made his complaints to the senate, and showed them the scars of his wounds, accusing his brother of having employed the assassins from whom he received them. Though Philometor was known to be a man of a most humane and mild disposition, and therefore very unlikely to have been concerned in so black an attempt; yet the senate, being offended at his refusing to submit to their decree concerning the island of Cyprus, hearkened to this false accusation; and carried their prejudice so far, that they not only refused to hear what his ambassadors had to say, but ordered them immediately to depart from the city. At the same time, they appointed five commissioners to conduct Physcon into Cyprus, and put him in possession of that island, enjoining all their allies in those parts to supply him with forces for that purpose.

37
He is de-
feated and
taken pri-
soner by
Philome-
tor.

Physcon having by this means got together an army which seemed to him to be sufficient for the accomplishment of his design, landed in Cyprus; but being there encountered by Philometor in person, he was entirely defeated, and obliged to shelter himself in a city called *Lapitho*. Here he was closely besieged, and at last obliged to surrender. Every one now expected that Physcon would have been treated as he deserved; but his brother, instead of punishing, restored him to the government of Libya and Cyrene, adding some other territories instead of the island of Cyprus, and promising him his daughter in marriage. Thus an end was put to the war between the two brothers; for the Romans were ashamed any longer to oppose a prince who had given such a signal instance of his justice and clemency.

On his return to Alexandria, Philometor appointed one Archias governor of Cyprus. But he, soon after the king's departure, agreed with Demetrius king of Syria, to betray the island to him for 500 talents. The treachery was discovered before it took effect; and the traitor, to avoid the punishment due to his crime,

N^o 110.

laid violent hands on himself. Ptolemy being offended with Demetrius for this attempt on Cyprus, joined Attalus king of Pergamus, and Ariarathes king of Cappadocia, in setting up a pretender to the crown of Syria. This was Alexander Balas; to whom he even gave his daughter Cleopatra in marriage, after he had placed him on the throne of Syria. But he, notwithstanding these and many other favours, being suspected of having entered into a plot against his benefactor, Ptolemy became his greatest enemy; and marching against him, routed his army in the neighbourhood of Antioch. He did not, however, long enjoy his victory; for he died in a few days after the engagement, of the wounds he had received.

38
Death of
Philome-
tor.

On the death of Philometor, Cleopatra the queen designed to secure the throne for her son. But some of the principal nobility declaring for Physcon, a civil war was about to ensue, when matters were compromised on condition that Physcon should marry Cleopatra, that he should reign jointly with her during his life, and declare her son by Philometor heir to the crown. These terms were no sooner agreed upon than Physcon married Cleopatra, and, on the very day of the nuptials, murdered her son in her arms.—This was only a prelude to the cruelties which he afterwards practised on his subjects. He was no sooner seated on the throne, than he put to death all those who had shown any concern for the murder of the young prince. He then wrecked his fury on the Jews, whom he treated more like slaves than subjects, on account of their having favoured the cause of Cleopatra. His own people were treated with little more ceremony. Numbers of them were every day put to death for the smallest faults, and often for no fault at all, but merely to gratify his unhuman temper. His cruelty towards the Alexandrians is particularly mentioned under the article ALEXANDRIA.—In a short time, being wearied of his queen, who was also his sister, he divorced her; and married her daughter, who was also called *Cleopatra*, and whom he had previously ravished. In short, his behaviour was so exceedingly wicked, that it soon became quite intolerable to his subjects; and he was obliged to fly to the island of Cyprus with his new queen, and *Memphis*, a son he had by her mother.

39
Monstrous
wickedness
of Physcon.

On the flight of the king, the divorced queen was placed on the throne by the Alexandrians; but Physcon, fearing lest a son whom he had left behind should be appointed king, sent for him into Cyprus, and caused him to be assassinated as soon as he landed. This provoked the people against him to such a degree, that they pulled down and dashed to pieces all the statues which had been erected to him in Alexandria. This the tyrant supposed to have been done at the instigation of the queen, and therefore resolved to revenge it on her by killing his own son whom he had by her. He therefore, without the least remorse, caused the young prince's throat to be cut; and having put his mangled limbs into a box, sent them as a present to his mother Cleopatra. The messenger with whom this box was sent, was one of his guards. He was ordered to wait till the queen's birth-day, which approached, and was to be celebrated with extraordinary pomp; and in the midst of the general rejoicing, he was to deliver the present.

40
He is driven
out.

The horror and detestation occasioned by this unexampled piece of cruelty cannot be expressed. An army

41
Murders
his son.

Egypt.

army was soon raised, and the command of it given to one *Marfyas*, whom the queen had appointed general, and enjoined to take all the necessary steps for the defence of the country. On the other hand, *Phyfcon*, having hired a numerous body of mercenaries, sent them, under the command of one *Hegelochus*, against the Egyptians. The two armies met on the frontiers of Egypt, on which a bloody battle ensued; but at last the Egyptians were entirely defeated, and *Marfyas* was taken prisoner. Every one expected that the captive general would have been put to death with the severest torments; but *Phyfcon*, perceiving that his cruelties only exasperated the people, resolved to try whether he could regain their affections by lenity; and therefore pardoned *Marfyas*, and set him at liberty.—*Cleopatra*, in the mean time, being greatly distressed by this overthrow, demanded assistance from *Demetrius* king of Syria, who had married her eldest daughter by *Philometor*, promising him the crown of Egypt for his reward. *Demetrius* accepted the proposal without hesitation, marched with all his forces into Egypt, and there laid siege to *Pelufium*. But he being no less hated in Syria than *Phyfcon* was in Egypt, the people of Antioch, taking advantage of his absence, revolted against him, and were joined by most of the other cities in Syria. Thus *Demetrius* was obliged to return; and *Cleopatra*, being now in no condition to oppose *Phyfcon*, fled to *Ptolemais*, where her daughter the queen of Syria at that time resided. *Phyfcon* was then restored to the throne of Egypt, which he enjoyed without further molestation till his death; which happened at Alexandria, in the 29th year of his reign, and 67th of his age.

42
Phyfcon re-
stored.

To *Phyfcon* succeeded *Ptolemy Lathyrus*, about 122 years before Christ; but he had not reigned long, before his mother, finding that he would not be entirely governed by her, by false surmises stirred up the Alexandrians, who drove him from the throne, and placed on it his youngest brother *Alexander*. *Lathyrus* after this was obliged to content himself with the government of Cyprus, which he was permitted to enjoy in quiet. *Ptolemy Alexander*, in the mean time, finding he was to have only the shadow of sovereignty, and that his mother *Cleopatra* was to have all the power, stole away privately from Alexandria. The queen used every artifice to bring him back, as well knowing that the Alexandrians would never suffer her to reign alone. At last her son yielded to her intreaties; but soon after, understanding that she had hired assassins to dispatch him, he caused her to be murdered.

43
Ptolemy
Lathyrus
driven out,
and Alex-
ander set
up.

44
Lathyrus
restored.

The death of the queen was no sooner known to the Alexandrians, than, disdaining to be commanded by a paricide, they drove out *Alexander*, and recalled *Lathyrus*.—The deposed prince for some time led a rambling life in the island of *Cos*; but having got together some ships, he, the next year, attempted to return into Egypt. But being met by *Tyrrhus*, *Lathyrus's* admiral, he was defeated, and obliged to fly to *Myra* in *Lycia*. From *Myra* he steered his course towards Cyprus, hoping that the inhabitants would place him on the throne, instead of his brother. But *Chareas*, another of *Lathyrus's* admirals, coming up with him while he was ready to land, an engagement ensued, in which *Alexander's* fleet was dispersed, and he himself killed.

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During these disturbances, *Apion* king of *Cyrenai- ca*, the son of *Ptolemy Physcon* by a concubine, having maintained peace and tranquillity in his dominions during a reign of 21 years, died, and by his will left his kingdom to the Romans: and thus the Egyptian empire was considerably reduced and circumscribed.

Egypt.

45
Cyrenaica
bequeathed
to the Ro-
mans.

Lathyrus being now delivered from all competitors, turned his arms against the city of *Thebes*, which had revolted from him. The king marched in person against the rebels; and, having defeated them in a pitched battle, laid close siege to their city. The inhabitants defended themselves with great resolution for three years. At last, however, they were obliged to submit, and the city was given up to be plundered by the soldiery. They left every where the most melancholy monuments of their avarice and cruelty; so that *Thebes*, which till that time had been one of the most wealthy cities of Egypt, was now reduced so low that it never afterwards made any figure.

46
City of
Thebes
ruined.

About 76 years before Christ, *Ptolemy Lathyrus* was succeeded by *Alexander II*. He was the son of the *Ptolemy Alexander* for whom *Lathyrus* had been driven out; and had met with many adventures. He was first sent by *Cleopatra* into the island of *Cos*, with a great sum of money, and all her jewels; as thinking that was the safest place where they could be kept. When *Mithridates* king of *Pontus* made himself master of that island, the inhabitants delivered up to him the young Egyptian prince, together with all the treasures. *Mithridates* gave him an education suitable to his birth; but he, not thinking himself safe with a prince who had shed the blood of his own children, fled to the camp of *Sylla* the Roman dictator, who was then making war in Asia. From that time he lived in the family of the Roman general, till news was brought to Rome of the death of *Lathyrus*. *Sylla* then sent him to Egypt to take possession of the throne. But, before his arrival, the Alexandrians had chosen *Cleopatra* for their sovereign. To compromise matters, however, it was agreed, that *Ptolemy* should marry her, and take her for his partner in the throne. This was accordingly done; and 19 days after the marriage, the unhappy queen was murdered by her husband, who for 15 years afterwards showed himself such a monster of wickedness, that a general insurrection at last ensued among his subjects, and he was obliged to fly to *Pompey* the Great, who was then carrying on the war against *Mithridates* king of *Pontus*. But *Pompey* refusing to concern himself in the matter, he retired to the city of *Tyre*, where he died some months after.

47
Alexander
II. succeeds
Lathyrus.

When he was forced to shut himself up in the city of *Tyre*, *Alexander* had sent ambassadors to Rome, in order to influence the senate in his favour. But, dying before the negotiation was finished, he made over by his last will all his rights to the Roman people, declaring them heirs to his kingdom: not out of any affection to the republic; but with a view to raise disputes between the Romans and his rival *Auletes*, whom the Egyptians had placed on the throne. The will was brought to Rome, where it occasioned warm debates. Some were for taking immediate possession of the kingdom. Others thought that no notice should be taken of such a will, because *Alexander* had no right to dispose of his dominions in prejudice of his successor, and to exclude from the crown those who were

48
Marries
Cleopatra,
and mur-
ders her.

49
Leaves his
kingdom to
the Ro-
mans.

^{Egypt.} of the royal blood of Egypt. Cicero represented, that such a notorious imposition would debase the majesty of the Roman people, and involve them in endless wars and disputes; that the fruitful fields of Egypt would be a strong temptation to the avarice of the people, who would insist on their being divided among them; and lastly, that by this means the bloody quarrels about the Agrarian laws would be revived. These reasons had some weight with the senate; but what chiefly prevented them from seizing on Egypt at this time was, that they had lately taken possession of the kingdom of Bithynia in virtue of the will of Nicomedes, and of Cyrene and Libya by the will of Apion. They thought, therefore, that if they should, on the like pretence, take possession of the kingdom of Egypt, this might too much expose their design of setting up a kind of universal monarchy, and occasion a formidable combination against them.

⁵⁰
Character
of Auletes
the new
king.

Auletes, who was now raised to the throne by the Egyptians, is said to have surpassed all the kings that went before him in the effeminacy of his manners. The name *Auletes*, which signifies the *flute-player*, was given him because he piqued himself on his skill in performing upon that instrument, and was not ashamed even to contend for the prize in the public games. He took great pleasure in imitating the manners of the Bacchanals; dancing in a female dress, and in the same measures that they used during the solemnity of their god Bacchus; and hence he had the surname of the *New Dionysius* or *Bacchus*. As his title to the crown was disputable (he being only the son of a concubine), the first care of Auletes was to get himself acknowledged by the Romans, and declared their ally. This was obtained by applying to Julius Cæsar, who was at that time consul, and immensely in debt. Cæsar being glad of such an opportunity of raising money, made the king of Egypt pay pretty dear for his alliance. Six thousand talents, a sum equal to L. 1,162,500 Sterling, were paid partly to Cæsar himself, and partly to Pompey, whose interest was necessary for obtaining the consent of the people. Though the revenues of Egypt amounted to twice this sum, yet Auletes found it impossible for him to raise it without severely taxing his subjects. This occasioned a general discontent; and while the people were almost ready to take up arms, a most unjust decree passed at Rome for seizing the island of Cyprus. When the Alexandrians heard of the intentions of the republic, they pressed Auletes to demand that island as an ancient appendage of Egypt; and, in case of a refusal, to declare war against that haughty and imperious people, who, they now saw, though too late, aimed at nothing less than the sovereignty of the world. With this request the king refused to comply; upon which his subjects, already provoked beyond measure at the taxes with which they were loaded, flew to arms, and surrounded the palace. The king had the good luck to escape their fury, and immediately leaving Alexandria, set sail for Rome.

⁵²
Is driven
from the
throne, and
flies to
Rome.

In his way to that city, he landed on the island of Rhodes, where the famous Cato at that time was, being on his way to Cyprus, to put the unjust decree of the senate in execution. Auletes, desirous to confer with a man of his prudence, immediately sent to acquaint him with his arrival. He imagined, that, up-

on this notice, Cato would immediately come and wait upon him; but the proud Roman told the messenger, that if the king of Egypt had any thing to say to Cato, he might, if he thought proper, come to his house. Accordingly the king went to pay him a visit; but was received with very little ceremony by Cato, who did not even vouchsafe to rise out of his seat when he came into his presence. When Auletes had laid his affairs before this haughty republican, he was blamed by him for leaving Egypt, the richest kingdom in the world, in order to expose himself, as he said, to the indignities he would meet with at Rome. There Cato told him, that nothing was in request but wealth and grandeur. All the riches of Egypt, he said, would not be sufficient to satisfy the avarice of the leading men in Rome. He therefore advised him to return to Egypt; and strive, by a more equitable conduct, to regain the affections of his people. He even offered to reconduct him thither, and employ his good offices in his behalf. But though Ptolemy was sensible of the propriety of this advice, the friends he had with him dissuaded him from following it, and accordingly he set out for Rome.

⁵³
Cato's ad-
vice to him.

On his arrival in this metropolis, the king found, to his great concern, that Cæsar, in whom he placed his greatest confidence, was then in Gaul. He was received, however, by Pompey with great kindness. He assigned him an apartment in his own house, and omitted nothing that lay in his power to serve him. But, notwithstanding the protection of so powerful a man, Auletes was forced to go from house to house like a private person, soliciting the votes of the senators. After he had spent immense treasures in procuring a strong party in the city, he was at last permitted to lay his complaints before the senate; and at the same time there arrived an embassy from the Alexandrians, consisting of 100 citizens, to acquaint the senate with the reasons of their revolt.

⁵⁴
Infamous
conduct of
Auletes.

When Auletes first set out for Rome, the Alexandrians, not knowing what was become of him, placed on the throne his daughter Berenice; and sent an embassy into Syria to Antiochus Asiaticus, inviting him into Egypt to marry the queen, and reign in partnership with her. Antiochus was dead before the arrival of the ambassadors; upon which the same proposal was made to his brother Seleucus, who readily accepted it. This Seleucus is described by Strabo as monstrously deformed in body, and still more so in mind. The Egyptians nicknamed him *Cybiosactes*, or *the Scullion*; a name which seemed more fit for him than any other. He was scarce settled on the throne, when he gave a signal instance of his sordid and avaricious temper. Ptolemy the first had caused the body of Alexander the Great to be deposited in a coffin of massy gold. This the king seized upon; and by that means provoked his wife Berenice to such a degree, that she caused him to be murdered. She then married one Archelaus, high priest of Comana in Pontus, who pretended to be the son of Mithridates the Great; but was, in fact, only the son of that monarch's general.

⁵⁵
Berenice
raised to the
throne of
Egypt.

⁵⁶
She marries
Seleucus,
and mur-
ders him.

Auletes was not a little alarmed on hearing of these transactions, especially when the ambassadors arrived, who he feared would overturn all the schemes he had laboured so much to bring about. The embassy was headed by one Dion, a celebrated academic philosopher, who

⁵⁷
Marries
Archelaus.

Egypt.

58
Auletes
murders the
Egyptian
ambassa-
dors.

who had many powerful friends at Rome. But Ptolemy found means to get both him and most of his followers assassinated; and this intimidated the rest to such a degree, that they durst not execute their commission, or, for some time, even demand justice for the murder of their colleagues.

59
His restora-
tion decreed
by the se-
nate.

The report of so many murders, however, at last spread a general alarm. Auletes, sure of the protection of Pompey, did not scruple to own himself the perpetrator of them. Nay, though an action was commenced against one Ascitius an assassin who had stabbed Dion the chief of the embassy above mentioned, and the crime was fully proved; yet he was acquitted by the venal judges, who had all been bribed by Ptolemy. In a short time, the senate passed a decree, by which it was enacted, that the king of Egypt should be restored by force of arms. All the great men in Rome were ambitious of this commission; which, they well knew, would be attended with immense profit. Their contests on this occasion took up a considerable time; and at last a prophecy of the Sybil was found out, which forbade the assisting an Egyptian monarch with an army. Ptolemy, therefore, wearied out with so long a delay, retired from Rome, where he had made himself generally odious, to the temple of Diana at Ephesus, there to wait the decision of his fate. Here he remained a considerable time: but as he saw that the senate came to no resolution, tho' he had solicited them by letters so to do; at last, by Pompey's advice, he applied to Gabinus the proconsul of Syria. This Gabinus was a man of a most infamous character, and ready to undertake any thing for money. Therefore, though it was contrary to an express law for any governor to go out of his province without positive orders from the senate and people of Rome, yet Gabinus ventured to transgress this law, upon condition of being well paid for his pains. As a recompence for his trouble, however, he demanded 10,000 talents; that is, L. 1,937,500 Sterling. Ptolemy, glad to be restored on any terms, agreed to pay the above mentioned sum; but Gabinus would not stir till he had received one-half of it. This obliged the king to borrow it from a Roman knight named *Caius Rabirius Posthumus*; Pompey interposing his credit and authority for the payment of the capital and interest.

60
Gabinus
undertakes
to restore
him for a
great sum.

Gabinus now set out for Egypt, attended by the famous Mark Anthony, who at this time served in the army under him. He was met by Archelaus, who since the departure of Auletes had reigned in Egypt jointly with Berenice, at the head of a numerous army. The Egyptians were utterly defeated, and Archelaus taken prisoner in the first engagement. Thus Gabinus might have put an end to the war at once: but his avarice prompted him to dismiss Archelaus on his paying a considerable ransom; after which, pretending that he had made his escape, fresh sums were demanded from Ptolemy for defraying the expences of the war. For these sums Ptolemy was again obliged to apply to Rabirius, who lent him what money he wanted at a very high interest. At last, however, Archelaus was defeated and killed, and thus Ptolemy again became master of all Egypt.

61
Archelaus
defeated
and killed.

No sooner was Auletes firmly settled on the throne, than he put to death his daughter Berenice, and oppressed his people with the most cruel exactions, in or-

der to procure the money he had been obliged to borrow while in a state of exile. These oppressions and exactions the cowardly Egyptians bore with great patience, being intimidated by the garrison which Gabinius had left in Alexandria. But neither the fear of the Romans, nor the authority of Ptolemy, could make them put up an affront offered to their religion. A Roman soldier happened to kill a cat, which was an animal held sacred and even worshipped by the Egyptians; and no sooner was this supposed sacrilege known, than the Alexandrians made a general insurrection, and, gathering together in crowds, made their way through the Roman guards, dragged the soldier out of his house, and, in spite of all opposition, tore him in pieces.

Notwithstanding the heavy taxes, however, which Ptolemy laid on his people, it doth not appear that he had any design of paying his debts. Rabirius, who, as we have already observed, had lent him immense sums, finding that the king affected delays, took a voyage to Egypt, in order to expostulate with him in person. Ptolemy paid very little regard to his expostulations; but excused himself on account of the bad state of his finances. For this reason he offered to make Rabirius collector-general of his revenues, that he might in that employment pay himself. The unfortunate creditor accepted the employment for fear of losing his debt. But Ptolemy, soon after, upon some frivolous pretence or other, caused him and all his servants to be closely confined. This base conduct exasperated Pompey as much as Rabirius; for the former had been in a manner security for the debt, as the money had been lent at his request, and the business transacted at a country house of his near Alba. However, as Rabirius had reason to fear the worst, he took the first opportunity of making his escape, glad to get off with life from his cruel and faithless debtor. To complete his misfortunes, he was prosecuted at Rome as soon as he returned, 1. For having enabled Ptolemy to corrupt the senate with sums lent him for that purpose. 2. For having debased and dishonoured the character of a Roman knight, by farming the revenues, and becoming the servant of a foreign prince. 3. For having been an accomplice with Gabinus, and sharing with him the 10,000 talents which that proconsul had received for his Egyptian expedition. By the eloquence of Cicero he was acquitted; and one of the best orations to be found in the writings of that author was composed on this occasion. Gabinus was also prosecuted; and, as Cicero spoke against him, he very narrowly escaped death. He was, however, condemned to perpetual banishment, after having been stripped of all he was worth. He lived in exile till the time of the civil wars, when he was recalled by Cæsar, in whose service he lost his life.

Auletes enjoyed the throne of Egypt about four years after his re-establishment; and at his death left his children, a son and two daughters, under the tuition of the Roman people. The name of the son was Ptolemy, those of the daughters were *Cleopatra* and *Arfinoe*. This was the Cleopatra who afterwards became so famous, and had so great a share in the civil wars of Rome. As the transactions of the present reign, however, are so closely connected with the affairs of Rome, that they cannot be well understood

Egypt.

62
Berenice
put to
death, and
the people
oppressed.

63
Ingratitude
of Auletes.

64
Leaves his
children to
the care of
the Ro-
mans.

Egypt. without knowing the situation of the Romans at that time, we refer for an account of them to the *History of Rome*.

65 State of Egypt till its conquest by the khalif of Cairwan.

With Cleopatra ended the family of Ptolemy Lagus, the founder of the Grecian empire in Egypt, after it had held that country in subjection for the space of 294 years. From this time Egypt became a province of the Roman empire, and continued subject to the emperors of Rome or Constantinople. In the year 642, it was conquered by the Arabs under Amru Ebn al As, one of the generals of the khalif Omar. In the year 889, an independent government was set up in this kingdom by Ahmed Ebn Tolun, who rebelled against Al Mokhadi khalif of Bagdad. It continued to be governed by him and his successors for 27 years, when it was again reduced by Al Moctafi khalif of Bagdad. In about 30 years after, we find it again an independent state, being joined with Syria under Mahomet Ebn Taj, who had been appointed governor of these provinces. This government, however, was also but short-lived; for in the year 968 it was conquered by Jawhar, one of the generals of Moez Ledinillah, the Fatemite khalif of Cairwan in Barbary. See BAR-

66

Moez takes possession of his new kingdom.

No sooner was Moez informed of the success of his general, than he prepared with all expedition to go and take possession of his new conquest. Accordingly he ordered all the vast quantities of gold which he and his predecessors had amassed, to be cast into ingots of the size and figure of the mill-stones used in hand-mills, and conveyed on camels backs into Egypt. To show that he was fully determined to abandon his dominions in Barbary, and to make Egypt the residence of himself and his successors, he caused the remains of the three former princes of his race to be removed from Cairwan in Barbary, and to be deposited in a stately mosque erected for that purpose in the city of Cairo in Egypt. This was a most effectual method to induce his successors to reside in Egypt also, as it was become an established custom and duty among those princes frequently to pay their respectful visits to the tombs of their ancestors.

67

Will not suffer prayers to be said for the khalif of Bagdad.

To establish himself the more effectually in his new dominions, Moez suppressed the usual prayers made in the mosques for the khalifs of Bagdad, and substituted his own name in their stead. This was complied with, not only in Egypt and Syria, but even throughout all Arabia, the city of Mecca alone excepted. The consequence was, a schism in the Mahomedan faith, which continued upwards of 200 years, and was attended with continual anathemas, and sometimes destructive wars between the khalifs of Bagdad and of Egypt.—Having fully established himself in his kingdom, he died in the 45th year of his age, three years after he had left his dominions in Barbary; and was succeeded by his son Abu Al Mansur Barar, surnamed Aziz Billah.

68

Unsuccessful expedition into Syria.

The new khalif succeeded to the throne at the age of 21; and committed the management of affairs entirely to the care of Jawhar, his father's long experienced general and prime minister. In 978, he sent this famous warrior to drive out Al Asteikin, the emir of Damascus. The Egyptian general accordingly formed the siege of that place; but at the end of two months, was obliged to raise it, on the approach of an

army of Karmatians under the command of Al Hakem.

Egypt.

As Jawhar was not strong enough to venture an engagement with these Karmatians, it was impossible for him to hinder them from effecting a junction with the forces of Al Asteikin. He therefore retreated, or rather fled, towards Egypt with the utmost expedition; but being overtaken by the two confederate armies, he was soon reduced to the last extremity. He was, however, permitted to resume his march, on condition that he passed under Al Asteikin's sword and Al Hakem's lance; and to this disgraceful condition Jawhar found himself obliged to submit. On his arrival in Egypt, he immediately advised Al Aziz to undertake an expedition in person into the east, against the combined army of Turks, Karmatians, and Damascenes, under the command of Al Asteikin and Al Hakem. The khalif followed his advice; and advancing against his enemies, overthrew them with great slaughter. Al Asteikin himself escaped out of the battle; but was afterwards taken and brought to Al Aziz, who made him his chamberlain, and treated him with great kindness. Jawhar, in the mean time, was disgraced on account of his bad success; and in this disgrace he continued till his death, which happened in the year of our Lord 990, and of the Hegira 381.

69

This year Al Aziz having received advice of the death of Saado'dawla prince of Aleppo, sent a formidable army under the command of a general named *Manjubekin*, to reduce that place. Lulu, who had been appointed guardian to Saado'dawla's son, finding himself pressed by the Egyptians, who carried on the siege with great vigour, demanded assistance from the Greek emperor. Accordingly, he ordered a body of troops to advance to Lulu's relief. Manjubekin, being informed of their approach, immediately raised the siege, and advanced to give them battle. An obstinate engagement ensued, in which the Greeks were at last overthrown with great slaughter. After this victory, Manjubekin pushed on the siege of Aleppo very briskly; but finding the place capable of defending itself much longer than he at first imagined, and his provisions beginning to fail, he raised the siege. The khalif upon this sent him a very threatening letter, and commanded him to return before Aleppo. He did so; and continued the siege for 13 months; during all which time it was defended by Lulu with incredible bravery. At last, the Egyptians hearing that a numerous army of Greeks was on their way to relieve the city, they raised the siege, and fled with the utmost precipitation. The Greeks then took and plundered some of the cities which Al Aziz possessed in Syria; and Manjubekin made the best of his way to Damascus, where he set up for himself. Al Aziz being informed of this revolt, marched in person against him with a considerable army; but being taken ill by the way, he expired, in the 21st year of his reign and 42d of his age.

Al Aziz was succeeded by his son Abu Al Mansur, surnamed Al Hakem; who, being only 11 years of age, was put under the tuition of an eunuch of approved integrity.

This reign is remarkable for nothing so much as the madness with which the khalif was seized in the latter part of it. This manifested itself first by his issuing many preposterous edicts; but at length grew to such

a

70 Strange madness of the khalif Al Hakem

⁷¹ Egypt. a height, that he fancied himself a god, and found no fewer than 16,000 persons who owned him as such. These were mostly the Dararians, a new sect sprung up about this time, who were so called from their chief, Mohammed Ebn Ishmael, surnamed Darari. He is supposed to have inspired the mad khalif with this impious notion; and, as Darari set up for a second Moses, he did not scruple to assert that Al Hakem was the great Creator of the universe. For this reason, a zealous Turk stabbed him in the khalif's chariot. His death was followed by a three days uproar in the city of Cairo; during which, Darari's house was pulled down, and many of his followers massacred. The sect, however, did not expire with its author. He left behind him a disciple named Hamza, who, being encouraged by the mad khalif, spread it far and wide through his dominions. This was quickly followed by an abrogation of all the Mahomedan fasts, festivals, and pilgrimages, the grand one to Mecca in particular; so that the zealous Mahometans were now greatly alarmed, as justly supposing that Al Hakem designed entirely to suppress the worship of the true God, and introduce his own in its place. From this apprehension, however, they were delivered by the death of the khalif; who was assassinated, by a contrivance of his own sister, in the year 1020.

Al Hakem was succeeded by his son Al Thaher, who reigned 15 years; and left the throne to a son under seven years of age, named Al Mostanser Billah.— In the year 1041, a revolt happened in Syria; but Al Mostanser having sent a powerful army into that country, under the command of one *Anushtekin*, he not only reduced the rebels, but considerably enlarged the Egyptian dominions in Syria.

⁷² Al Mostanser attempted the conquest of Bagdad. In 1054, a Turk named Al Bassafiri, having quarrelled with the vizir Al Kayem khalif of Bagdad, fled to Egypt, and put himself under the protection of Al Mostanser. The latter, imagining this would be a favourable opportunity for enlarging his dominions, and perhaps seizing on the city of Bagdad, supplied Bassafiri with money and troops. By this assistance, he was enabled to possess himself of Arabian Irak, and ravaged that province to the very gates of Bagdad. On this, Al Kayem wrote to Togrol Beg, or Tangrolipix, the Turkish sultan, who possessed very extensive dominions in the east, to come to his assistance. The sultan immediately complied with his request, and soon arrived at Bagdad with a formidable army and 18 elephants. Of this Bassafiri gave notice to Al Mostanser, and intreated him to exert himself further for his support against so powerful an enemy. This was accordingly done, but nothing worthy of notice happened till the year 1058. At this time Bassafiri having found means to excite Ibrahim the sultan's brother to a revolt, Togrol Beg was obliged to employ all his force against him. This gave Bassafiri an opportunity of seizing on the city of Bagdad itself; and the unfortunate khalif, according to some, was taken prisoner, or, according to others, fled out of the city. Bassafiri, on his entry, caused Al Mostanser to be immediately proclaimed khalif in all quarters of the city. Al Kayem's vizir he caused to be led on a camel through the streets of Bagdad, dressed in a woollen gown, with a high red bonnet, and a leathern collar about his neck; a man lashing him all the way behind. Then being sewed

up in a bull's hide, with the horns placed over his head, and hung upon hooks, he was beaten without ceasing till he died. The imperial palace was plundered, and the khalif himself detained a close prisoner.

⁷⁴ This success was but short-lived; for, in 1059, Togrol Beg defeated his brother Ibrahim, took him prisoner, and strangled him with a bow-string. He then marched to Bagdad, which Bassafiri thought proper to abandon at his approach. Here the khalif Al Kayem was delivered up by Mahras, the governor of a city called *Haditha*, who had the charge of him. The khalif was immediately restored to his dignity; which Bassafiri no sooner understood, than he again advanced towards the city. Against him Togrol Beg sent a part of his army under some of his generals, while he himself followed with the rest. A battle ensued, in which the army of Bassafiri was defeated, and he himself killed. His head was brought to Togrol Beg, who caused it to be carried on a pike through the streets of Bagdad.

⁷⁵ Thus the hopes of Al Mostanser were entirely frustrated; and from this period we may date the decline of the Egyptian empire under the khalifs. They had made themselves masters of almost all Syria; but no sooner was Bassafiri's bad success known, than the younger part of the citizens of Aleppo revolted, and set up Mahmud Azzo'dawla, who immediately laid siege to the citadel. Al Mostanser sent a powerful army against him, which Azzo'dawla entirely defeated, and took the general himself prisoner; and soon after this, he made himself master both of the city and citadel, with all their dependencies. In his new dominions he behaved with the greatest cruelty, destroying every thing with fire and sword, and making frequent incursions into the neighbouring provinces, which he treated in the same manner.

⁷⁶ This disaster was soon followed by others still more terrible. In 1066, a famine raged over all Egypt and Syria, with such fury, that dogs and cats were sold for four or five Egyptian dinars each, and other provisions in proportion. Multitudes of people died in Cairo for want of food. Nay, so great was the scarcity, that the vizir had but one servant left who was able to attend him to the khalif's palace, and to whom he gave the care of his horse when he alighted at the gate. But, at his return, he was surprised to find that the horse had been carried off, killed, and eaten by the famished people. Of this he complained to the khalif; who caused three of them who had carried off the horse to be hanged. Next day, however, he was still more surprised to hear, that all the flesh had been picked off the bones of the three unhappy criminals, so that nothing but the skeletons were left. And to such a degree of misery were the inhabitants, not only in Cairo but through all Egypt, reduced, that the carcases of those who died were sold for food at a great price, instead of being buried. All this time the khalif showed the greatest kindness and beneficence towards his unhappy subjects, inasmuch that of 10,000 horses, mules, and camels, which he had in his stables when the famine began, he had only three left when it was removed.

⁷⁷ The famine was followed by a plague; and this by an invasion of the Turks under Abu Ali Al Hasan the Naserod'dawla, the very general who had been sent against

Egypt. gainst the rebel Azzo'dawla and defeated by him. He began with besieging the khalif in his own palace; and the unhappy prince, being in no condition to make resistance, was obliged to buy himself off at the expence of every thing valuable that was left in his exhausted capital and treasury. This, however, did not hinder these merciless plunderers from ravaging all the Lower Egypt from Cairo to Alexandria, and committing the most horrid cruelties through that whole tract.—This happened in the years 1067 and 1068; and in 1069 and 1070, there happened two other revolts in Syria: so that this country was now almost entirely lost.

78
Jerusalem
taken.

In 1095 died the khalif Al Mostanser, having reigned 60 years; and was succeeded by his son Abul Kasem, surnamed Al Mostali.—The most remarkable transaction of this prince's reign, was his taking the city of Jerusalem from the Turks in 1098: but this success was only of short duration; for it was, the same year, taken by the crusaders.

79
A revolution
in the
kingdom.

From this time to the year 1164, the Egyptian history affords little else than an account of the intestine broils and contests between the vizirs or prime ministers, who were now become so powerful, that they had in a great measure stripped the khalifs of their civil power, and left them nothing but a shadow of spiritual dignity. These contests at last gave occasion to a revolution, by which the race of Fatemite khalifs was totally extinguished. This revolution was accomplished in the following manner.—One *Shawer*, having overcome all his competitors, became vizir to Al Aded, the eleventh khalif of Egypt. He had not been long in possession of this office, when Al Dargam, an officer of rank, endeavoured to deprive him of it. Both parties quickly had recourse to arms; and a battle ensued, in which Shawer was defeated, and obliged to fly to Nuroddin prince of Syria, by whom he was graciously received, and who promised to reinstate him in his office of vizir. As an inducement to Nuroddin to assist him more powerfully, Shawer told him that the crusaders had landed in Egypt, and made a considerable progress in the conquest of it. He promised also, that, in case he was reinstated in his office, he would pay Nuroddin annually the third part of the revenues of Egypt; and would, besides, defray the whole expence of the expedition.

As Nuroddin bore an implacable hatred to the Christians, he readily undertook an expedition against them, for which he was to be so well paid. He therefore sent an army into Egypt under the command of Shawer and a general named *Asadoddin*. Dargam, in the mean time, had cut off so many generals whom he imagined favourable to Shawer's interest, that he thereby weakened the military force of the kingdom, and in a great measure deprived himself of the power of resistance. He was therefore easily overthrown by *Asadoddin*, and Shawer reinstated in the office of vizir. The faithless minister, however, no sooner saw himself firmly established in his office, than he refused to fulfil his engagements to Nuroddin by paying the stipulated sums. Upon this, *Asadoddin* seized Pelusium and some other cities. Shawer then entered into an alliance with the crusaders, and *Asadoddin* was besieged by their combined forces in Pelusium. Nuroddin, however, having invaded the Christian dominions in Syria, and taken a

Egypt. strong fortrefs called *Harem*, Shawer and his confederates thought proper to hearken to some terms of accommodation, and *Asadoddin* was permitted to depart for Syria.

In the mean time, Nuroddin, having subdued the greatest part of Syria and Mesopotamia, resolved to make Shawer feel the weight of his resentment, on account of his perfidious conduct. He therefore sent back *Asadoddin* into Egypt with a sufficient force, to compel Shawer to fulfil his engagements: but this the vizir took care to do before the arrival of *Asadoddin*; and thus, for the present, avoided the danger. It was not long, however, before he gave Nuroddin fresh occasion to send this general against him. That prince had now driven the crusaders almost entirely out of Syria, but was greatly alarmed at their progress in Egypt; and consequently offended at the alliance which Shawer had concluded with them, and which he still persisted in observing. This treaty was also thought to be contrived on purpose to prevent Shawer from being able to fulfil his promise to Nuroddin, of sending him annually a third of the revenues of Egypt. Nuroddin therefore again dispatched *Asadoddin* into Egypt, in the year 1166, with a sufficient force, and attended by the famous *Salahaddin*, or *Saladin*, his own nephew. They entered the kingdom without opposition, and totally defeated Shawer and the crusaders. They next made themselves masters of Alexandria; and, after that, over-ran all the Upper Egypt. *Saladin* was left with a considerable garrison in Alexandria; but *Asadoddin* was no sooner gone, than the crusaders laid siege to that city. This at last obliged *Asadoddin* to return to its relief. The great losses he had sustained in this expedition probably occasioned his agreeing to a treaty with Shawer, by which he engaged to retire out of Egypt, upon being paid a sum of money.

Asadoddin was no sooner gone, than Shawer entered into a fresh treaty with the Franks. By this new alliance he was to attack Nuroddin in his own dominions, as he was at that time engaged in quelling some revolters, which would effectually prevent his sending any more forces into Egypt. This treaty so provoked the Syrian prince, that he resolved to suspend his other conquests for some time, and exert his whole strength in the conquest of Egypt.

By this time the crusaders had reduced Pelusium, and made a considerable progress in the kingdom, as well as in some other countries, through the divisions which reigned among the Mahometan princes. In such places as they conquered, they put almost every body to the sword, Christians as well as Mahometans; selling their prisoners for slaves, and giving up the towns to be plundered by the soldiers. From Pelusium they marched to Cairo; which was then in no posture of defence, and in the utmost confusion, by reason of the divisions which reigned in it. Shawer, therefore, as soon as he heard of their approach, caused the ancient quarter called *Mesr* to be set on fire, and the inhabitants to retire into the other parts. He also prevailed upon the khalif to solicit the assistance of Nuroddin; which the latter was indeed pretty much inclined of himself to grant, as it gave him the fairest opportunity he could have wished for, both of driving the crusaders out of Egypt, and of seizing the king-

80
Conquests
of the cru-
saders.

dom

Egypt. dom to himself. For this purpose he had already raised an army of 60,000 horse under his general Asadoddin; and, on the receipt of Al Aded's message, gave them orders to set out immediately. The crusaders were now arrived at Cairo; and had so closely besieged that place, that neither Shawer nor the khalif knew any thing of the approach of the Moslem army which was hastening to their relief. The vizir, therefore, finding it impossible to hold out long against the enemy, had recourse to his old subterfuge of treaties and high promises. He sent the enemy 100,000 dinars, and promised them 900,000 more, if they would raise the siege; which they, dreading the approach of Asadoddin, very readily accepted.

81 They are repulsed by the army of Nuroddin prince of Damascus. The army of Nuroddin now approached the capital by hasty marches, and were every where received with the greatest demonstrations of joy. Asadoddin, on his arrival at Cairo, was invited by Al Aden to the royal palace, where he was entertained in the most magnificent manner, and received several presents; nor were Saladin and the other principal officers less magnificently treated. Shawer also, conscious of his perfidious conduct, was no less assiduous in attending punctually upon him. But having invited the general and some others to an entertainment, he had formed a scheme of having them seized and murdered. The plot, however, being discovered, Shawer himself had his head cut off, and Asadoddin was made vizir in his stead. He did not, however, long enjoy his new dignity; for he died two months and five days after his instalment, being succeeded in his office of vizir by his nephew Saladin.

82 Saladin becomes vizir of Egypt. The new vizir was the youngest of all the grandees who aspired to that office, but had already given some signal proofs of his valour and conduct. What determined the khalif to prefer him to all the rest is not known; but it is certain that some of them were highly displeased with his promotion, and even publicly declared that they would not obey him. In order to gain these to his interest, therefore, Saladin found it necessary to distribute among them part of the vast treasures left by his uncle; by which means he soon governed Egypt without controul, as had been customary with the vizirs for some time before. Soon after his being installed into the office of vizir, he gave a total defeat to the negroes who guarded the royal palace, and had opposed his election; by which means, and a strong garrison he had placed in the castle of Cairo, his power became firmly established. Though he had not the least intention of continuing in his allegiance to Nuroddin, he did not think it prudent at first to declare himself. He sent for his father, however, and the rest of his family, who were in Nuroddin's dominions, in order, as he said, to make them partakers of his grandeur and happiness. Nuroddin did not think proper to deny this request; though, being already jealous of the great power of Saladin, he insisted that his family should consider him only as one of his generals in Egypt.

A good understanding subsisted between Nuroddin and Saladin for some time, which did not a little contribute to raise the credit of the latter with the Egyptians. In 1169, Nuroddin sent him orders to omit the name of Al Aded, the khalif of Egypt, in the public prayers, and substitute that of the khalif of Bagdad in its place. This was at any rate a dangerous at-

tempt; as it might very readily produce a revolt in favour of Al Aded; or if it did not, it gave Saladin an opportunity of engrossing even that small remnant of power which was left to the khalif. Al Aded, however, was not sensible of his disgrace; for he was on his death-bed, and past recovery, when Nuroddin's orders were executed. After his death, Saladin seized on **83** all his wealth and valuable effects; which consisted of effects of jewels of prodigious size, sumptuous furniture, a library the khalif, containing 100,000 volumes, &c. His family he caused to be closely confined in the most private and retired part of the palace; and either manumitted his slaves, or kept them for himself, or disposed of them to others.

Saladin was now arrived at the highest pitch of wealth, power, and grandeur. He was, however, obliged to behave with great circumspection with regard to Nuroddin; who still continued to treat him as his vassal, and would not suffer him to dispute the least of his commands. He relied for advice chiefly on his father Ayub; who was a consummate politician, and very ambitious of seeing his son raised to the throne of Egypt. He therefore advised Saladin to continue **84** steadfast in his resolutions; and, whilst he amused Nuroddin with feigned submissions, to take every method in his power to secure himself in the possession of so valuable a kingdom. Nuroddin himself, however, was too great a master in the art of dissimulation to be easily imposed on by others; and therefore, though he pretended to be well pleased with Saladin's conduct, he was all this time raising a powerful army, with which he was fully determined to invade Egypt the following year. But while he meditated this expedition, he was seized with a quinsy at the castle of Damascus, which put an end to his life, in the year 1173.

Saladin, though now freed from the apprehensions of such a formidable enemy, dared not venture to assume the title of *Sovereign*, while he saw the successor of Nuroddin at the head of a very powerful army, and no less desirous than able to dispossess him. For this reason his first care was to secure to himself an asylum, in case he should be obliged to leave Egypt altogether. For this purpose he chose the kingdom of Nubia; but having dispatched his brother Malek Turanshah thither, at the head of a considerable army, the latter was so much struck with the sterility and desolate appearance of the country, that he returned without attempting any thing. Saladin then sent his brother into **85** Subdues Arabia Felix. Arabia Felix, in order to subdue that country, which had been for some time held by Abdalnabi an Arabian prince. Malek entered the country without opposition; and having brought Abdalnabi to a general action, entirely defeated him, took him prisoner, and threw him into irons. He then over-ran and reduced under subjection to Saladin great part of the country, taking no fewer than 80 castles or fortresses of considerable strength.

After this good fortune, Saladin, now sure of a convenient place of refuge in case of any misfortune, assumed the title of *Sultan* or sovereign of Egypt; and **86** was acknowledged as such by the greater part of the states. The zeal of the Egyptians for the Fatemite khalifs, however, soon produced a rebellion. One *Al Kanz*, or *Kanzanaddowla*, governor of a city in Upper Egypt, assembled a great army of blacks, or rather *swarthy*

^{Egypt.} swarthy natives; and marching directly into the lower country, was there joined by great numbers of other Egyptians. Against them Saladin dispatched his brother Malek, who soon defeated and entirely dispersed them. This, however, did not prevent another insurrection under an impostor, who pretended to be David the son of Al Aden the last Fatemite khalif, and had collected a body of 100,000 men. But before these had time to do any great damage, they were surprised by the sultan's forces, and entirely defeated. Above 300 were publicly hanged, and a vast number perished in the field, insomuch that it was thought scarce a fourth part of the whole body escaped.

About this time Saladin gained a considerable advantage over the crusaders, commanded by William II. king of Sicily. That prince had invaded Egypt with a numerous fleet and army, with which he laid close siege to Alexandria both by sea and land. Saladin, however, marched to the relief of the city with such surprising expedition, that the crusaders were seized with a sudden panic, and fled with the utmost precipitation, leaving all their military engines, stores, and baggage behind.

⁸⁷

Saladin made sovereign of Damascus.

In the year 1175, the inhabitants of Damascus begged of Saladin to accept the sovereignty of that city and its dependencies; being jealous of the minister, who had the tuition of the reigning prince, and who governed all with an absolute sway. The application was no sooner made, than the sultan set out with the utmost celerity to Damascus, at the head of a chosen detachment of 700 horse. Having settled his affairs in that city, he appointed his brother Saif Al Islam governor of it; and set out for Hems, to which he immediately laid siege. Having made himself master of this place, he then proceeded to Hamah. The city very soon surrendered, but the citadel held out for some time. Saladin pretended that he accepted the sovereignty of Damascus and the other places he had conquered, only as deputy to Al Malek Al Saleh, the successor of Nurroddin, and who was then under age; and that he was desirous of sending Azzoddin, who commanded in the citadel, with a letter to Aleppo, where the young prince resided. This so pleased Azzoddin, that he took the oath of fidelity to Saladin, and immediately set out with the sultan's letter. He had not, however, been long at Aleppo before he was by the minister's orders thrown into prison; upon which his brother, who had been appointed governor of the citadel Hamah in his absence, delivered it up to Saladin without further ceremony. The sultan then marched to Aleppo, with a design to reduce it; but, being vigorously repulsed in several attacks, he was at last obliged to abandon the enterprise. At the same time, Kamschlegin, Al Malek's minister or vizir, hired the chief of the Bata-nists, or Assassins*, to murder him. Several attempts were made in consequence of this application; but all of them, happily for Saladin, miscarried.

* See Assassins.

After raising the siege of Aleppo, Saladin returned to Hems, which place the crusaders had invested. On his approach, however, they thought proper to retire; after which, the sultan made himself master of the strong castle belonging to that place, which, before, he had not been able to reduce. This was soon followed by the reduction of Baalbec; and these rapid conquests so alarmed the ministers of Al Malek, that,

N^o 110.

entering into a combination with some of the neighbouring princes, they raised a formidable army, with which they designed to crush the sultan at once. Saladin, fearing the event of a war, offered to cede Hems and Hamah to Al Malek, and to govern Damascus only as his lieutenant: but these terms being rejected, a battle ensued; in which the allied army was utterly defeated, and the shattered remains of it shut up in the city of Aleppo. This produced a treaty, by which Saladin was left master of all Syria, excepting only the city of Aleppo and the territory belonging to it.

^{Egypt.}
⁸⁸
Defeats his enemies.

In 1176 Saladin returned from the conquest of Syria, and made his triumphal entry into Cairo. Here, having rested himself and his troops for some time, he began to encompass the city with a wall 29,000 cubits in length, but which he did not live to finish. Next year he led a very numerous army into Palestine against the crusaders. But here his usual good fortune failed him. His army was entirely defeated. Forty thousand of his men were left dead on the field; and the rest fled with so much precipitation, that, having no towns in the neighbourhood where they could shelter themselves, they traversed the vast desert between Palestine and Egypt, and scarce stopped till they reached the capital itself. The greatest part of the army by this means perished; and as no water was to be had in the desert above mentioned, almost all the beasts died of thirst before the fugitives arrived on the confines of Egypt. Saladin himself seemed to have been greatly intimidated; for in a letter to his brother Al Malek, he told him, that "he was more than once in the most imminent danger; and that God, as he apprehended, had delivered him from thence, in order to reserve him for the execution of some grand and important design."

In the year 1182, the sultan set out on an expedition to Syria with a formidable army, amidst the acclamations and good wishes of the people. He was, however, repulsed with loss both before Aleppo and Al Mawfel, after having spent much time and labour in besieging these two important places.

In the mean time, a most powerful fleet of European ships appeared on the Red-Sea, which threatened the cities of Mecca and Medina with the utmost danger. The news of this armament no sooner reached Cairo, than Abu Becr, Saladin's brother, who had been left viceroy in the sultan's absence, caused another to be fitted out with all speed under the command of Lulu, a brave and experienced officer; who quickly came up with them, and a dreadful engagement ensued. The Christians were defeated after an obstinate resistance, and all the prisoners butchered in cold blood. This proved such a terrible blow to the Europeans, that they never more ventured on a like attempt.

⁹⁰
The Christians receive a great defeat at sea.

In 1183, Saladin continued to extend his conquests. The city of Amida in Mesopotamia surrendered to him in eight days; after which, being provoked by some violences committed by the prince of Aleppo, he resolved at all events to make himself master of that place. He was now attended with better success than formerly; for as his army was very numerous, and he pushed on the siege with the utmost vigour, Amaddoddin the prince capitulated, upon condition of being allowed to possess certain cities in Mesopotamia which

⁹¹
Saladin's rapid conquests.

had

Egypt.

had formerly belonged to him, and being ready to attend the sultan on whatever expedition he pleased. After the conquest of Aleppo, Saladin took three other cities, and then marched against his old enemies the crusaders. Having sent out a party to reconnoitre the enemy, they fell in with a considerable detachment of Christians; whom they easily defeated, taking about 100 prisoners, with the loss of only a single man on their side. The sultan, animated by this first instance of success, drew up his forces in order of battle, and advanced against the crusaders, who had assembled their whole army at Sepphoris in Galilee. On viewing the sultan's troops, however, and perceiving them to be greatly superior in strength to what they had at first apprehended, they thought proper to decline an engagement, nor could Saladin with all his skill force them to it. But though it was found impossible to bring the crusaders to a decisive engagement, Saladin found means to harass them greatly, and destroyed great numbers of their men. He carried off also many prisoners, dismantled three of their strongest cities, laid waste their territories, and concluded the campaign with taking another strong town.

92
Christians
totally de-
feated.

For three years Saladin continued to gain ground on the crusaders, yet without any decisive advantage; but in 1187, the fortune of war was remarkably unfavourable to them. The Christians now found themselves obliged to venture a battle, by reason of the cruel ravages committed in their territories by Saladin, and by reason of the encroachments he daily made on them. Both armies therefore being resolved to exert their utmost efforts, a most fierce and bloody battle ensued. Night prevented victory from declaring on either side, and the fight was renewed with equal obstinacy next day. The victory was still left undecided; but the third day the sultan's men finding themselves surrounded by the enemy on all sides but one, and there also hemmed in by the river Jordan, so that there was no room to fly, fought like men in despair, and at last gained a most complete victory. Vast numbers of the Christians perished on the field. A large body found means to retire in safety to the top of a neighbouring hill covered with wood; but being surrounded by Saladin's troops, who set fire to the wood, they were all obliged to surrender at discretion. Some of them were butchered by their enemies as soon as they delivered themselves into their hands, and others thrown into irons. Among the latter were the king of Jerusalem himself, Arnold prince of Al Shawbec and Al Carac, the masters of the Templars and Hospitalers, with almost the whole body of the latter. So great was the consternation of the Christians on this occasion, that one of Saladin's men is said to have taken 30 of them prisoners, and tied them together with the cord of his tent, to prevent them from making their escape. The masters of the Templars and Hospitalers, with the knights acting under them, were no sooner brought into Saladin's presence, than he ordered them all to be cut in pieces. He called them *Assassins* or *Batanists*; and had been wont to pay 50 dinars for the head of every Templar or Hospitaler that was brought him. After the engagement, Saladin seated himself in a magnificent tent, placing the king of Jerusalem on his right hand, and Arnold prince of Al Shawbec and Al

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Carac on his left. Then he drank to the former, who was at that time ready to expire with thirst, and at the same time offered him a cup of snow-water. This was thankfully received; and the king immediately drank to the prince of Al Carac, who sat near him. But here Saladin interrupted him with some warmth: "I will not (says he) suffer this cursed rogue to drink; as that, according to the laudable and generous custom of the Arabs, would secure to him his life." Then, turning towards the prince, he reproached him with having undertaken the expedition while in alliance with himself, with having intercepted an Egyptian caravan in the time of profound peace, and massacring the people of which it was composed, &c. Notwithstanding all this, he told him, he would grant him his life, if he would embrace Mahometanism. This condition, however, was refused; and the sultan, with one stroke of his scimeter, cut off the prince's head. This greatly terrified the king of Jerusalem; but Saladin assured him he had nothing to fear, and that Arnold had brought on himself a violent death by his want of common honesty.

The crusaders being thus totally defeated and dispersed, Saladin next laid siege to Tiberias, which capitulated in a short time. From thence he marched towards Acca or Ptolemais, which likewise surrendered after a short siege. Here he found 4000 Mahometan prisoners in chains, whom he immediately released. As the inhabitants enjoyed at present a very extensive trade, the place being full of merchants, he found there not only vast sums of money, but likewise a great variety of wares exceedingly valuable, all which he seized and applied to his own use. About the same time his brother Al Malec attacked and took a very strong fortress in the neighbourhood; after which the sultan divided his army into three bodies, that he might with the greater facility over-run the territories of the Christians. Thus, in a very short time, he made himself master of Neapolis, Cæsarea, Sepphoris, and other cities in the neighbourhood of Ptolemais, where his soldiers found only women and children, the men having been all killed or taken prisoners. His next conquest was Joppa, which was taken by storm after a vigorous resistance. Every thing being then settled, and a distribution made of the spoils and captives, Saladin marched in person against Tebrien, a strong fortress in the neighbourhood of Sidon; which was taken by assault, after it had sustained a siege of six days. No sooner was he master of this place, than he ordered the fortress to be razed, and the garrison put to the sword. From Tebrien the victorious sultan proceeded to Sidon itself; which, being deserted by its prince, surrendered almost on the first summons. Berytus was next invested, and surrendered in seven days. Among the prisoners Saladin found in this place the prince of a territory called *Hobeil*, who by way of ransom delivered up his dominions to him, and was of consequence released. About the same time, a Christian ship, in which was a nobleman of great courage and experience in war, arrived at the harbour of Ptolemais, not knowing that it was in the hands of Saladin. The governor might easily have secured the vessel; but neglecting the opportunity, she escaped to Tyre, where the above mentioned nobleman, together with the prince of Hobeil, contributed not a little

Egypt.

93
His further
conquests.

Egypt.
94
Jerusalem
taken.

to retrieve the affairs of the Christians, and enable them to make a stand for four years after.

Saladin in the mean time went on with his conquests. Having made himself master of Ascalon after a siege of 14 days, he next invested Jerusalem. The garrison was numerous, and made an obstinate defence; but Saladin having at last made a breach in the walls by sapping, the besieged desired to capitulate. This was at first refused; upon which the Christian ambassador made the following speech: "If that be the case, know, O sultan, that we who are extremely numerous, and have been restrained from fighting like men in despair only by the hopes of an honourable capitulation, will kill all our wives and children, commit all our wealth and valuable effects to the flames, massacre 5000 prisoners now in our hands, leave not a single beast of burden or animal of any kind belonging to us alive, and level with the ground the rock you esteem sacred, together with the temple Al Akfa. After this we will fall out upon you in a body; and doubt not but we shall either cut to pieces a much greater number of you than we are, or force you to abandon the siege." This desperate speech had such an effect upon Saladin, that he immediately called a council of war, at which all the general officers declared, that it would be most proper to allow the Christians to depart unmolested. The sultan therefore allowed them to march out freely and securely with their wives, children, and effects; after which he received ten dinars from every man capable of paying that sum, five from every woman, and two from every young person under age. For the poor who were not able to pay any thing, the rest of the inhabitants raised the sum of 30,000 dinars.

Most of the inhabitants of Jerusalem were escorted by a detachment of Saladin's troops to Tyre; and soon after, he advanced with his army against that place. As the port was blocked up by a squadron of five men of war, Saladin imagined that he should easily become master of it. But in this he found himself mistaken. For, one morning by break of day, a Christian fleet fell upon his squadron, and entirely defeated it; nor did a single vessel escape their pursuit. A considerable number of the Mahometans threw themselves into the sea during the engagement; most of whom were drowned, though some few escaped. About the same time Saladin himself was vigorously repulsed by land; so that, after calling a council of war, it was thought proper to raise the siege.

In 1188, Saladin, though his conquests were not so rapid and considerable as hitherto, continued still superior to his enemies. He reduced the city of Laodicea and some others, together with many strong castles; but met also with several repulses. At last he took the road to Antioch; and having reduced all the fortresses that lay in his way, many of which had been deemed impregnable, Bohemond prince of Antioch was so much intimidated, that he desired a truce for seven or eight months. This Saladin found himself obliged to comply with, on account of the prodigious fatigues his men had sustained, and because his auxiliaries now demanded leave to return home.

95
Crusaders
retrieve
their af-
fairs.

All these heavy losses of the Christians, however, proved in some respects an advantage, as they were thus obliged to lay aside their animosities, which had originally proved the ruin of their affairs. Those who

had defended Jerusalem, and most of the other fortresses taken by Saladin, having retreated to Tyre, formed there a very numerous body. This proved the means of preserving that city, and also of re-establishing their affairs for the present. For, having received powerful succours from Europe, they were enabled in 1189 to take the field with 30,000 foot and 2000 horse. Their first attempt was upon Alexandretta; from whence they dislodged a strong party of Mahometans, and made themselves masters of the place with very little loss. They next laid siege to Ptolemais; of which Saladin had no sooner received intelligence, than he marched to the relief of the place. After several skirmishes with various success, a general engagement ensued, in which Saladin was defeated with the loss of 10,000 men. This enabled the Christians to carry on the siege of Ptolemais with greater vigour; which place, however, they were not able to reduce for the space of two years.

This year the sultan was greatly alarmed by an account that the emperor of Germany was advancing to Constantinople with an army of 260,000 men, in order to assist the other crusaders. This prodigious armament, however, came to nothing. The multitude was so reduced with sickness, famine, and fatigue, that scarce 1000 of them reached the camp before Ptolemais. The siege of that city was continued, though with bad success on the part of the Christians. They were repulsed in all their attacks, their engines were burnt with naphtha, and the besieged always received supplies of provisions in spite of the utmost efforts of the besiegers; at the same time that a dreadful famine and pestilence raged in the Christian camp, which sometimes carried off 200 people a-day.

In 1191, the Christians received powerful succours from Europe. Philip II. of France, and Richard I. of England (from his great courage surnamed *Cœur de Lion*), arrived before the camp at Ptolemais. The latter was esteemed the bravest and most enterprising of all the generals the crusaders had; and the spirits of his soldiers were greatly elated by the thoughts of acting under such an experienced commander. Soon after his arrival, the English sunk a Mahometan ship of vast size, having on board 650 soldiers, a great quantity of arms and provisions, going from Berytus to Ptolemais. Of the soldiers and sailors who navigated this vessel, only a single person escaped; who being taken prisoner by the English, was dispatched to the sultan with the news of the disaster. The besieged still defended themselves with the greatest resolution; and the king of England happening to fall sick, the operations of the besiegers were considerably delayed. On his recovery, however, the attacks were renewed with such fury, that the place was every moment in danger of being taken by assault. This induced them to send a letter to Saladin, informing him, that if they did not receive succours the very next day, they would be obliged to submit. As this town was the sultan's principal magazine of arms, he was greatly affected with the account of their distress, especially as he found it impossible to relieve them. The inhabitants, therefore, found themselves under a necessity of surrendering the place. One of the terms of the capitulation was, that the crusaders should receive a very considerable sum of money from Saladin, in consequence

Egypt.

96

Richard I.
of England
arrives in
Asia.

Egypt.

quence of their delivering up the Mahometan prisoners they had in their hands. This article Saladin refused to comply with; and in consequence of his refusal, Richard caused 3000 of those unfortunate men to be slaughtered at once.

97
Defeats Sa-
ladin.

After the reduction of Ptolemais, the king of England, now made generalissimo of the crusaders, took the road to Ascalon, in order to besiege that place; after which, he intended to make an attempt upon Jerusalem itself. Saladin proposed to intercept his passage, and placed himself in the way with an army of 300,000 men. On this occasion was fought one of the greatest battles of that age. Saladin was totally defeated, with the loss of 40,000 men; and Ascalon soon fell into the hands of the crusaders. Other sieges were afterwards carried on with success, and Richard even approached within sight of Jerusalem, when he found, that, by reason of the weakened state of his army, and the divisions which prevailed among the officers who commanded it, he should be under the necessity of concluding a truce with the sultan. This was accordingly done in the year 1192; the term was, three years, three months, three weeks, three days, and three hours; soon after which the king of England set out on his return to his own dominions.

98
Mamlouks
become
masters of
Egypt.

In 1193 Saladin died, to the inexpressible grief of all true Mahometans, who held him in the utmost veneration. His dominions in Syria and Palestine were shared out among his children and relations into many petty principalities. His son Othman succeeded to the crown of Egypt; but as none of his successors possessed the enterprising genius of Saladin, the history from that time to the year 1250 affords nothing remarkable. At this time the reigning sultan Malek Al Salek was dethroned and slain by the *Mamelucs* or *Mamlouks*, as they are called, a kind of mercenary soldiers who served under him. In consequence of this revolution, the Mamelucs became masters of Egypt, and chose a sultan from among themselves.—These Mamlouks are thought to have been young Turks or Tartars, sold to private persons by the merchants, from whom they were bought by the sultan, educated at his expence, and employed to defend the maritime places of the kingdom. The reason of this institution originally was, that the native Egyptians were become so cowardly, treacherous, and effeminate, from a long course of slavery, that they were unfit for arms. The Mamlouks, on the contrary, made most excellent soldiers; for having no friends but among their own corps, they turned all their thoughts to their own profession. According to M. Volney, they came originally from Mount Caucasus, and are distinguished by the flaxen colour of their hair. Here they were found by the crusaders, and were by them called *Mamelucs*, or more correctly *Mamlouks*. The expedition of the Tartars in 1227 proved indirectly the means of introducing them into Egypt. These horrible conquerors, having slaughtered and massacred till they were weary, brought along with them an immense number of slaves of both sexes, with whom they filled all the markets in Asia. The Turks, taking advantage of the opportunity, purchased about 12,000 young men, whom they bred up in the profession of arms, in which they soon attained to great perfection; but becoming mutinous, like the

99
Account of
them.

Roman pretorian bands, they turned their arms against their masters, and in 1250 deposed and murdered the khalif, as has been already related.

The Mamlouks having got possession of the government, and neither understanding nor putting a value upon any thing besides the art of war, every species of learning decayed in Egypt, and a great degree of barbarism was introduced. Neither was their empire of long duration notwithstanding all their martial abilities. The reason of this was, that they were originally only a small part of the sultan of Egypt's standing forces. As a numerous standing army was necessary in a country where the fundamental maxim of government was, that every native must be a slave, they were at first at a loss how to act; being justly suspicious of all the rest of the army. At last they resolved to buy Christian slaves, and educate them in the same way that they themselves had formerly been. These were commonly brought from Circassia, where the people, though they professed Christianity, made no scruple of selling their children. When they were completed in their military education, these soldiers were disposed of through all the fortresses erected in the country to bridle the inhabitants; and because in their language such a fort was called *Borge*, the new militia obtained the name of *Borgites*. By this expedient the Mamlouks imagined they would be able to secure themselves in the sovereignty. But in this they were mistaken. In process of time, the old Mamlouks grew proud, insolent, and lazy: and the Borgites, taking advantage of this, rose upon their masters, deprived them of the government, and transferred it to themselves about the year 1382.

Egypt.

The Borgites, as well as the former, assumed the name of *Mamlouks*; and were famous for their valour and ferocity of conduct. They were almost perpetually engaged in wars either foreign or domestic; and their dominion lasted till the year 1517, when they were invaded by Selim the Turkish sultan. The Mamlouks defended themselves with incredible valour; notwithstanding which, being overpowered by numbers, they were defeated in every engagement. The same year, their capital, the city of Cairo, was taken, with a terrible slaughter of those who defended it. The sultan was forced to fly; and, having collected all his force, ventured a decisive battle. The most romantic efforts of valour, however, were insufficient to cope with the innumerable multitude which composed the Turkish army. Most of his men were cut in pieces, and the unhappy prince himself was at last obliged to take shelter in a marsh. He was dragged from his hiding place, where he had stood up to the shoulders in water, and soon after put to death. With him ended the glory, and almost the existence, of the Mamlouks, who were now every where searched for and cut in pieces.

100
Driven out
by the Bor-
gites.

101
Egypt con-
quered by
Selim.

This was the last great revolution in the Egyptian affairs; a revolution very little to the advantage of the natives, who may well doubt whether their ancient or modern conquerors have behaved with the greater degree of barbarity. Selim gave a specimen of his government, the very day after his being put in full possession of it by the death of Tuman Bey the unfortunate sultan above mentioned. Having ordered a theatre to be erected with a throne upon it on the banks of the

Egypt. Nile, he caused all the prisoners, upwards of 30,000 in number, to be beheaded in his presence, and their bodies thrown into the river.

102
His horrid
cruelty.

103
New form
of govern-
ment in-
troduced by
Selim.

Notwithstanding this horrid cruelty of Selim, he did not attempt the total extermination of the race of Mamlouks, though this would have been quite agreeable to the maxims of Turkish policy; but in the present case he seems to have recollected, that if he established a pacha in Egypt with the same powers with which he invested those of other parts, he would be under strong temptations to revolt by reason of the distance from the capital. He therefore proposed a new form of government, by which the power being distributed among the different members of the state, should preserve an equilibrium, so that the dependence of the whole should be upon himself. With this view, he chose from among the Mamlouks who had escaped the general massacre, a divan, or council of regency, consisting of the pacha and chiefs of the seven military corps. The former was to notify to this council the orders of the Porte, to send the tribute to Constantinople, and provide for the safety of government both external and internal; while, on the other hand, the members of the council had a right to reject the orders of the pacha, or even of deposing him, provided they could assign sufficient reasons. All civil and political ordinances must also be ratified by them. Besides this, he formed the whole body into a republic; for which purpose he issued an edict to the following purpose: "Though, by the help of the Almighty, we have conquered the whole kingdom of Egypt with our invincible armies; nevertheless our benevolence is willing to grant to the 24 fangiacs (A) of Egypt a republican government, with the following conditions.

104
His edict
for a re-
public.

"I. That our sovereignty shall be acknowledged by the republic; and in token of their obedience, our lieutenant shall be received as our representative: but to do nothing against our will or the republic; but, on the contrary, shall co-operate with it for its welfare on all occasions. Or if he shall attempt to infringe any of its privileges, the republic is at liberty to suspend him from his authority, and to send to our Sublime Porte a complaint against him, &c.

"II. In time of war, the republic shall provide 12,000 troops at its own expence, to be commanded by a fangiac or fangiacs.

"III. The republic shall raise annually and send to our Sublime Porte the sum of 560,000 aslany (B), accompanied by a fangiac, who shall have a satisfactory receipt, &c.

"IV. The same sum to be raised for the use of Medina, and Kiabe or Mecca.

"V. No more troops or janizaries shall be kept by the republic in time of peace than 14,000; but in time of war they may be increased to oppose our and the republic's enemies.

"VI. The republic shall send annually to our granary, out of the produce of the country, one million

of casiz (C) or measures of corn, viz. 600,000 of wheat and 400,000 of barley.

Egypt.

"VII. The republic, fulfilling these articles, shall have a free government over all the inhabitants of Egypt, independent of our lieutenant; but shall execute the laws of the country with the advice of the mollah or high priest under our authority and that of our successors.

"VIII. The republic shall be in possession of the mint as heretofore; but with this condition, that it shall be under the inspection of our lieutenant, that the coin may not be adulterated.

"IX. That the republic shall elect a *sheik bellet* out of the number of beys, to be confirmed by our lieutenant; and that the said sheik bellet shall be our representative, and shall be esteemed by all our lieutenants, and all our officers both of high and low rank, as the head of the republic; and if our lieutenant is guilty of oppression, or exceeds the bounds of his authority, the said sheik bellet shall represent the grievances of the republic to our Sublime Porte: but in case any foreign enemy or enemies disturb the peace of the republic, we and our successors engage to protect it with our utmost power until peace is re-established, without any cost or expence to the republic.

"Given and signed by our *clemency* to the republic of Egypt."

Thus the power of the Mamlouks still continued in The Turk-
a very considerable degree, and by degrees increased its power
so much as to threaten a total loss of dominion to the now almost
Turks. During the last 50 years, the Porte having entirely
relaxed from its vigilance, such a revolution has taken
place, that the Turkish power is now almost reduced
to nothing. But in order to understand this, we must
consider the way in which the race of Mamlouks is
continued or multiplied in Egypt. This is not in the
ordinary way, by marriage: on the contrary, M. Vol-
ney assures us, that "during 550 years in which there
have been Mamlouks in Egypt, not one of them has children of
left subsisting issue; all their children perish in the first the Mam-
or second descent. Almost the same thing holds good lous and
with regard to the Turks; and it is observed, that die in E-
they can only secure the continuance of their families gypt.
by marrying women who are natives, which the Mam-
louks have always disdained. The means by which
they are perpetuated and multiplied are the same by
which they were first established, viz. by slaves brought
from their original country. From the time of the
Moguls this commerce has been continued on the
banks of the Cuban and Phasis in the same manner as
it is carried on in Africa, by the wars among the ho-
stile tribes, and the misery or avarice of the inhabi-
tants, who sell their children to strangers. The slaves
thus procured are first brought to Constantinople, and
afterwards dispersed through the empire, where they
are purchased by the wealthy. When the Turks sub-
dued Egypt (says M. Volney), they should undoubt-
edly have prohibited this dangerous traffic; their omit-
ting

105

Why the
children of
the Mam-
louks and
Turks all
die in E-
gypt.

106

(A) These fangiacs are the governors of provinces.
(B) Each of these coins is in value about half a crown English; and the tribute since that time has been augmented to 800,000 aslany, or about L. 100,000 Sterling.
(C) Each casiz weighs 25 occa, and each occa is equal to two pounds ten ounces English avoirdupoise weight.

Egypt.

ting which seems about to dispossess them of their conquest, and which several political errors have long been preparing.

"For a considerable time the Porte had neglected the affairs of this province; and in order to restrain the Pachas, had suffered the divan to extend its power till the chiefs of the janizaries and azabs were left without control. The soldiers themselves, become citizens by the marriages they had contracted, were no longer the creatures of Constantinople; and a change introduced into their discipline still more increased these disorders. At first the seven military corps had one common treasury; and though the society was rich, individuals, not having any thing at their own disposal, could effect nothing. The chiefs, finding their power diminished by this regulation, had interest enough to get it abolished, and obtained permission to possess distinct property, lands, and villages. And as these lands and villages depended on the Mamlouk governors, it was necessary to conciliate them to prevent their oppressions. From that moment the beys acquired an ascendancy over the soldiers, who till then had treated them with disdain; and this could not but continually increase, since their governments procured them considerable riches. These they employed in creating themselves friends and creatures. They multiplied their slaves; and after emancipating them, employed all their interest to promote them to various employments, and advance them in the army. These upstarts, retaining for their patrons the same superstitious veneration common in the East, formed factions implicitly devoted to their pleasure." Thus, about the year 1746, Ibrahim, one of the kiayas (D) of the janizaries, rendered himself in reality master of Egypt; having managed matters so well, that of the 24 beys or sangiacs eight were of his household. His influence too was augmented by always leaving vacancies in order to enjoy the emoluments himself; while the officers and soldiers of his corps were attached to his interest; and his power was completed by gaining over Rodoan, the most powerful of all the colonels, to his interest. Thus the Pacha became altogether unable to oppose him, and the orders of the Sultan were less respected than those of Ibrahim. On his death in 1757, his family, *i. e.* his enfranchised slaves, continued to rule in a despotic manner. Waging war, however, among each other, Rodoan and several other chiefs were killed; until, in 1766, Ali Bey, who had been a principal actor in the disturbances, overcame his enemies, and for some time rendered himself absolute master of Egypt.

107
Authority
usurped by
Ibrahim
Kiaya.

108
History of
Ali Bey.

Of this man there are various accounts. The following is that given by M. Volney. He begins with observing, that the private history of the Mamlouks in general must be subject to great uncertainty, by reason of their being generally carried off from their parents at a time of life when they can remember but little or nothing of their parents; and he remarks, that they are likewise unwilling to communicate the little they may happen to remember. It is most commonly supposed, however, that Ali Bey was born among the Abazans, a people of Mount Cau-

casus; from whom, next to the Circassians, the slaves most valued by the Turks, and other nations who deal in that commodity, are to be obtained. Having been brought to a public sale at Cairo, Ali Bey was bought by two Jew brothers named Isaac and Yousef, who made a present of him to Ibrahim Kiaya. At this time he is supposed to have been about 13 or 14 years old, and was employed by his patron in offices similar to those of the pages belonging to European princes. The usual education was also given him; *viz.* that of learning to manage a horse well; fire a carbine and pistol; throw the djerid, a kind of dart used in the diversions of that country, and which shall be afterwards described. He was also taught the exercise of the sabre, and a little reading and writing. In all the feats of activity just mentioned, he discovered such impetuosity, that he obtained the surname of *Djendali*, or "madman;" and, as he grew up, discovered an ambition proportionable to the activity displayed in his youth. About the age of 18 or 20, his patron gave him his freedom; the badge of which among the Turks is the letting the beard grow, for among that people it is thought proper only for women and slaves to want a beard. By his kind patron also he was promoted to the rank of kachef or governor of a district, and at last elected one of the 24 beys. By the death of Ibrahim in 1757, he had an opportunity of satisfying his ambition; and now engaged in every scheme for the promotion or disgrace of the chiefs, and had a principal share in the ruin of Rodoan Kiaya above mentioned. Rodoan's place was quickly filled by another, who did not long enjoy it; and in 1762 Ali Bey, then styled *Shaik-el-Beled*, having got Abdelrahman, the possessor at that time, exiled, procured himself to be elected in his room. However, he soon shared the fate of the rest, being condemned to retire to Gaza. This place, being under the dominion of a Turkish pacha, was by no means agreeable; for which reason Ali having turned off to another place, kept himself concealed for some time, until in 1766 his friends at Cairo procured his recall. On this he appeared suddenly in that city; and in one night killed four of the beys who were inimical to his designs, banished the rest, and assumed the whole power to himself. Still, however, his ambition was not satisfied; and he determined on nothing less than to throw off his dependence on the Porte altogether, and become sultan of Egypt. With this view he expelled the pacha, refused to pay the accustomed tribute, and in the year 1768 proceeded to coin money in his own name. The Porte being at that time on the eve of a dangerous war with Russia, had not leisure to attend to the proceedings of Ali Bey; so that the latter had an opportunity of going forward with his enterprizes very vigorously. His first expedition was against an Arabian prince named *Hammam*; against whom he sent his favourite Mohammed Bey, under pretence that the former had concealed a treasure entrusted with him by Ibrahim Kiaya, and that he afforded protection to rebels. Having destroyed this unfortunate prince, he next began to put in execution a plan proposed to him by

Egypt.

109

He is
bought and
educated
by Ibrahim
Kiaya.

110
He is ban-
ished, but
returns, and
throws off
the Turkish
yoke.

111

Overcomes
an Arabian
prince.

(D) These were the commanding officers of the janizaries, azabs, &c. who after the first year laid down their employments, and became veterans, with a voice in the divan.

¹¹²
Egypt. Proposes to make Mecca the emporium of East Indian commerce.

by a young Venetian merchant, of rendering Gedda, the port of Mecca, an emporium for all the commerce of India; and even imagined he should be able to make the Europeans abandon the passage to the Indies by the Cape of Good Hope. With this view, he fitted out some vessels at Suez; and manning them with Mamlouks, commanded the bey Hassan to sail with them to Gedda, and seize upon it, while a body of cavalry under Mohammed Bey advanced against the town. Both these commissions were executed according to his wish, and Ali became quite intoxicated with his success. Nothing but ideas of conquest now occupied his mind, without considering the immense disproportion between his own force and that of the Grand Signior. Circumstances, it must be owned, were at that time very favourable to his schemes. The Sheik Daher was in rebellion against the Porte in Syria; and the pacha of Damascus had so exasperated the people by his extortions, that they were ready for a revolt. Having therefore made the necessary preparations, Ali Bey dispatched in 1770 about 500 Mamlouks to take possession of Gaza, and thus secure an entrance into Palestine. Osman the pacha of Damascus, however, no sooner heard of the invasion than he prepared for war with the utmost diligence, while the troops of Ali Bey held themselves in readiness to fly on the first attack. They were relieved from their embarrassment by Sheik Daher, who hastened to their assistance, while Osman fled without even offering to make the least resistance; thus leaving the enemy masters of all Palestine without striking a stroke. About the end of February 1771, the grand army of Ali Bey arrived; which, by the representations made of it in Europe, was supposed to consist of 60,000 men. M. Volney, however, informs us, that this army was far from containing 60,000 soldiers; though he allows that there might be two-thirds of that number, who were classed as follows: 1. Five thousand Mamlouks, constituting the whole effective part of the army. 2. Fifteen hundred Arabs from Barbary on foot, constituting the whole infantry of the army. Besides these, the servants of the Mamlouks, each of whom had two, would constitute a body of 10,000 men. A number of other servants would constitute a body of about 2000; and the rest of the number would be made up by sutlers and other usual attendants on armies. It was commanded by Mohammed Bey the friend of Ali. "But (says our author) as to order and discipline, these must not be mentioned. The armies of the Turks and Mamlouks are nothing but a confused multitude of horsemen, without uniforms, on horses of all colours and sizes, without either keeping their ranks or observing any regular order." This rabble took the road to Acre, leaving wherever they passed sufficient marks of their rapacity and want of discipline. At Acre a junction was formed with the troops of Sheik Daher, consisting of 1500 Safadians (the name of Shaik Daher's subjects, from *Safad*, a village of Galilee, originally under his jurisdiction). These were on horseback, and accompanied by 1200 Motualis cavalry under the command of Sheik Nasif, and about 1000 Mogrebian infantry. Thus they proceeded towards Damascus, while Osman prepared to oppose them by another army equally numerous and ill regulated: and M. Volney gives the following description of their operations.

¹¹³
His expedition into Syria.

¹¹⁴
Volney's account of his army.

"The reader must not here figure to himself a number of complicated and artificial movements; such as those which, within the last century, have reduced war with us to a science of system and calculation. The Asiatics are unacquainted with the first elements of this conduct. Their armies are mere mobs, their marches ravages, their campaigns inroads, and their battles bloody frays. The strongest or the most adventurous party goes in quest of the other, which frequently flies without making any resistance. If they stand their ground, they engage pell-mell, discharge their carbines, break their spears, and hack each other with their sabres; for they have seldom any cannon, and when they have, they are but of little service. A panic frequently diffuses itself without cause; one party flies, the other shouts victory; the vanquished submit to the will of the conqueror, and the campaign often terminates without a battle.

"Such, in a great measure, were the military operations in Syria in the year 1771. The combined army of Ali Bey and Sheik Daher marched to Damascus. The Pachas waited for them; they approached, and, on the 6th of June, a decisive action took place: the Mamlouks and Safadians rushed on the Turks with such fury, that, terrified at their courage, they immediately took to flight, and the Pachas were not the last in endeavouring to make their escape. The allies became masters of the country, and took possession of the city without opposition, there being neither walls nor soldiers to defend it. The castle alone resisted. Its ruined fortifications had not a single cannon, much less gunners; but it was surrounded by a muddy ditch, and behind the ruins were posted a few musketeers; and these alone were sufficient to check this army of cavalry. As the besieged, however, were already conquered by their fears, they capitulated the third day, and the place was to be surrendered next morning, when, at day-break, a most extraordinary revolution took place."

This was no less than the defection of Mohammed Bey himself, whom Osman had gained over in a conference during the night. At the moment, therefore, that the signal of surrender was expected, this treacherous general sounded a retreat, and turned towards Egypt with all his cavalry, flying with as great precipitation as if he had been pursued by a superior army. Mohammed continued his march with such celerity, that the report of his arrival in Egypt reached Cairo only six hours before him. Thus Ali Bey found himself at once deprived of all his expectations of conquest; and what was worse, found a traitor whom he durst not punish at the head of his forces. A sudden reverse of fortune now took place. Several vessels laden with corn for Sheik Daher were taken by a Russian privateer; and Mohammed Bey, whom he designed to have put to death, not only made his escape, but was so well attended, that he could not be attacked. His followers continuing daily to increase in number, Mohammed soon became sufficiently strong to march towards Cairo; and, in the month of April 1772, having defeated the troops of Ali in a rencounter, entered the city sword in hand, while the latter had scarce time to make his escape with 800 Mamlouks. With difficulty he was enabled to get to Syria by the assistance of Sheik Daher, whom he immediately joined with the

¹¹⁵
Egypt. Their absurd method of carrying on war.

¹¹⁶
Defection of Ali Bey's general.

¹¹⁷
He is driven out of Cairo, and with difficulty gets into Syria.

troops

Egypt.

118
Defeats the
Turks, and
retrieves
his affairs.

119
He is ruin-
ed by his
own impa-
tience.

120
He succeeded
by Moham-
med Bey.

121
His expe-
dition a-
gainst Sheik
Daher.

troops he had with him. The Turks under Osman were at that time besieging Sidon, but raised the siege on the approach of the allied army, consisting of about 7000 cavalry. Though the Turkish army was at least three times their number, the allies did not hesitate to attack them, and gained a complete victory. Their affairs now began to wear a more favourable aspect; but the military operations were retarded by the siege of Yafa, a place which had revolted; and which, though defended only by a garden wall, without any ditch, held out for eight months. In the beginning of 1773 it capitulated, and Ali Bey began to think of returning to Cairo. For this purpose Sheik Daher had promised to furnish him with succours; and the Russians, with whom he had now contracted an alliance, made him a promise of the like kind. Ali, however, ruined every thing by his own impatience. Deceived by an astrologer, who pretended that the auspicious moment when he was highly favoured by the stars was just arrived, he would needs set out without waiting for the arrival of his allies. He was also farther deceived by a stratagem of Mohammed, who had by force extorted from the friends of Ali Bey letters pressing his return to Cairo, where the people were weary of his ungrateful slave, and wanted only his presence in order to expel him. Confiding in these promises, Ali Bey imprudently set out with his Mamlouks and 1500 Safadians given him by Daher; but had no sooner entered the desert which separates Gaza from Egypt, than he was attacked by a body of 1000 chosen Mamlouks who were lying in wait for his arrival. They were commanded by a young Bey, named *Mourad*; who, being enamoured of the wife of Ali Bey, had obtained a promise of her from Mohammed, in case he could bring him her husband's head. As soon as Mourad perceived the dust by which the approach of Ali Bey's army was announced, he rushed upon him, attacked and took prisoner Ali Bey himself, after wounding him in the forehead with a sabre. Being conducted to Mohammed Bey, the latter pretended to treat him with extraordinary respect, and ordered a magnificent tent to be erected for him; but in three days he was found dead of his wounds, as was given out; though some affirm, perhaps with equal reason, that he was poisoned.

After the death of Ali Bey, Mohammed Bey took up on him the supreme dignity; but this change of matters proved of very little service to the Egyptians. At first he pretended to be only the defender of the rights of the Sultan, remitted the usual tribute to Constantinople, and took the customary oath of unlimited obedience; after which he solicited permission to make war upon Sheik Daher, the ally of Ali Bey. The reason of this request was a mere personal pique; and as soon as it was granted, he made the most diligent preparations for war. Having procured an extraordinary train of artillery, he provided foreign gunners, and gave the command of them to an Englishman named Robinson. He brought from Suez a cannon 16 feet long, which had for a considerable time remained useless; and at length, in the month of February 1776, he appeared in Syria with an army equal in number to that which he had formerly commanded when in the service of Ali Bey. Daher's forces, despairing of being able to cope with such a formidable armament, abandoned Gaza, which Mohammed immediately took

possession of, and then marched towards a fortified town named Yafa. The history of this siege M. Volney gives as a specimen of the Asiatic manner of conducting operations of that kind. "Yafa (says he), the ancient Joppa, is situated on a part of the coast, the general level of which is very little above the sea. The city is built on an eminence, in the form of a sugar loaf, in height about 130 feet perpendicular. The houses, distributed on the declivity, appear rising above each other, like the steps of an amphitheatre. On the summit is a small citadel, which commands the town; the bottom of the hill is surrounded by a wall without a rampart, of 12 or 14 feet high, and two or three in thickness. The battlements on the top are the only tokens by which it is distinguished from a common garden wall. This wall, which has no ditch, is environed by gardens, where lemons, oranges, and citrons grow in this light soil to a most prodigious size. The city was defended by five or six hundred Safadians and as many inhabitants, who, at the sight of the enemy, armed themselves with their sabres and muskets; they had likewise a few brass cannon, 24 pounders, without carriages; these they mounted as well as they could, on timbers prepared in a hurry; and supplying the place of experience by hatred and courage, they replied to the summons of the enemy with menaces and cannon-shot.

"Mohammed, finding he must have recourse to force, formed his camp before the town; but was so little acquainted with the business in which he was engaged, that he advanced within half cannon-shot. The bullets, which showered upon the tents, apprizing him of his error, he retreated; and, by making a fresh experiment, was convinced he was still too near. At length he discovered the proper distance, and set up his tent, in which the most extravagant luxury was displayed: around it, without any order, were pitched those of the Mamlouks, while the Barbary Arabs formed huts with the trunks and branches of the orange and lemon-trees, and the followers of the army arranged themselves as they could: a few guards were distributed here and there; and, without making a single entrenchment, they called themselves encamped.

"Batteries were now to be erected; and a spot of rising ground was made choice of to the south-eastward of the town, where, behind some garden walls, eight pieces of cannon were pointed, at 200 paces from the town; and the firing began, notwithstanding the musketry of the enemy, who, from the tops of the terraces, killed several of the gunners.

"It is evident that a wall only three feet thick, and without a rampart, must soon have a large breach in it; and the question was not how to mount, but how to get through it. The Mamlouks were for doing it on horseback; but they were made to comprehend that this was impossible; and they consented, for the first time, to march on foot. It must have been a curious sight to see them, with their huge breeches of thick Venetian cloth, embarrassed with their tucked up *beniches*, their crooked sabres in hand, and pistols hanging to their sides, advancing and tumbling among the ruins of the wall. They imagined that they had conquered every difficulty when this obstacle was surmounted; but the besieged, who formed a better judgment, waited till they arrived at the empty space between

Egypt.

122
Account of
the siege of
Yafa: a
specimen of
the Asiatic
method of
besieging
towns.

Egypt.

between the city and wall; where they assailed them from the terraces and windows of the houses with such a shower of bullets, that the Mamlouks did not so much as think of setting them on fire, but retired under a persuasion that the breach was utterly impracticable, since it was impossible to enter it on horseback. Morad Bey brought them several times back to the charge, but in vain.

123
The town
taken and
the inhabi-
tants massa-
cred.

"Six weeks passed in this manner; and Mohammed was distracted with rage, anxiety, and despair. The besieged however, whose numbers were diminished by the repeated attacks, became weary of defending alone the cause of Daher. Some persons began to treat with the enemy; and it was proposed to abandon the place, on the Egyptians giving hostages. Conditions were agreed upon, and the treaty might be considered as concluded, when, in the midst of the security occasioned by this belief, some Mamlouks entered the town; numbers of others followed their example, and attempted to plunder. The inhabitants defended themselves, and the attack recommenced: the whole army then rushed into the town, which suffered all the horrors of war; women and children, young and old men, were all cut to pieces, and Mohammed, equally mean and barbarous, caused a pyramid formed of the heads of these unfortunate sufferers to be raised as a monument of his victory."

124
Death of
Moham-
med Bey.

By this disaster the greatest terror and consternation were every where diffused. Sheik Daher himself fled, and Mohammed soon became master of Acre also. Here he behaved with his usual cruelty, and abandoned the city to be plundered by his soldiers. The French merchants claimed an exemption, and it was procured with the utmost difficulty: nor was even this likely to be of any consequence; for Mohammed, informed that the treasures of Ibrahim Kiaya of Daher had been deposited in that place, made an immediate demand of them, threatening every one of the merchants with death if the treasures were not instantly produced. A day was appointed for making the research; but before this came, the tyrant himself died of a malignant fever after two days illness. His death was no sooner known than the army made a precipitate retreat, such as has been already mentioned from Damascus. Sheik Daher continued his rebellion for some time, but was at last entirely defeated, and his head sent to Constantinople by Hassan Pacha the Turkish high-admiral.

125
History of
Egypt from
that time
to the year
1786.

The death of Mohammed was no sooner known in Egypt, than Morad Bey hastened to Cairo in order to dispute the sovereignty with Ibrahim Bey, who had been entrusted with the government on his departure from that place for Syria. Preparations for war were made on both sides; but at last, both parties finding that the contest must be attended with great difficulty, as well as very uncertain in the event, thought proper to come to an accommodation, by which it was agreed that Ibrahim should retain the title of Shaik El Beled, and the power was to be divided between them. But now the beys and others who had been promoted by Ali Bey, perceiving their own importance totally annihilated by this new faction, resolved to shake off the yoke, and therefore united in a league under the title of *the House of Ali Bey*. They conducted their matters with so much silence and dexterity, that both Morad and Ibrahim were obliged to abandon Cairo. In

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a short time, however, they returned and defeated their enemies though three times their number; but notwithstanding this success, it was not in their power totally to suppress the party. This indeed was owing entirely to their unskilfulness in the art of war, and their operations for some time were very trifling. At last, a new combination having been formed among the beys, five of them were sentenced to banishment in the Delta. They pretended to comply with this order, but took the road of the desert of the Pyramids, through which they were pursued for three days to no purpose. At last they arrived safe at *Miniah*, a village situated on the Nile, 40 leagues above Cairo. Here they took up their residence, and being masters of the river, soon reduced Cairo to distress by intercepting its provisions. Thus a new expedition became necessary, and Ibrahim took the command of it upon himself. In the month of October 1783, he set out with an army of 3000 cavalry; the two armies soon came in sight of each other, but Ibrahim thought proper to terminate the affair by negotiation. This gave such offence to Morad, who suspected some plot against himself, that he left Cairo. A war betwixt the two rivals was now daily expected, and the armies continued for 25 days in sight of each other, only separated by the river. Negotiations took place; and the five exiled beys, finding themselves abandoned by Morad, took to flight, but were pursued and brought back to Cairo. Peace seemed now to be re-established; but the jealousy of the two rivals producing new intrigues, Morad was once more obliged to quit Cairo in 1784. Forming his camp, however, directly at the gates of the city, he appeared so terrible to Ibrahim, that the latter thought proper in his turn to retire to the desert, where he remained till March 1785. A new treaty then took place; by which the rivals agreed to share the power between them, though there was certainly very little probability that such a treaty would be long observed. Since that time we have no accounts of any remarkable transaction in Egypt; nor indeed can we reasonably expect any thing of consequence in a country where matters are managed, as M. Volney expresses himself, by a series of "cabals, intrigues, treachery, and murders."

Of late Egypt has been visited by several travellers, all of whom have published descriptions of the country, its productions, inhabitants, &c. The latest are M. Savary, M. Volney, the baron de Tott, and Mr Bruce; and from the accounts published by those gentlemen the following geographical description is principally compiled.

This country is still divided into two principal parts, called the *Upper* and *Lower Egypt*. According to M. Savary, the former is only a long narrow valley beginning at Sienna and terminating at Cairo. It is bounded by two chains of mountains running from north to south, and taking their rise from the last cataract of the Nile. On reaching the latitude of Cairo they separate to the right and left; the one taking the direction of mount Colzoum, the other terminating in some sand-banks near Alexandria; the former being composed of high and steep rocks, the latter of sandy hillocks over a bed of calcareous stone. Beyond these mountains are deserts bounded by the Red Sea on the east, and on the west by other parts of Africa; having

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in the middle that long plain which, even where widest, is not more than nine leagues over. Here the Nile is confined in its course betwixt these insuperable barriers, and during the time of its inundation overflows the country all the way to the foot of the mountains; and Mr Bruce observes that there is a gradual slope from the bed of the river to those mountains on both sides. The baron de Tott says, that the mountains four leagues from the Nile, and facing Cairo, "are only a ridge of rocks about 40 or 50 feet high, which divide Egypt from the plains of Libya; which ridge accompanies the course of the river, at a greater or lesser distance, and seems as if only intended to serve as a bank to the general inundation."

Lower Egypt, according to M. Savary, comprehends all the country between Cairo, the Mediterranean, the Isthmus of Suez, and Libya. "This immense plain (says he) presents on the borders of its parching sands a stripe of lands cultivated along the canals of the river, and in the middle a triangular island to which the Greeks gave the name of *Delta*;" at the top of the angle of which the Baron de Tott informs us the rocks of Libya and the coasts of Arabia open and recede from each other towards the east and west, parallel to the Mediterranean. This great extent of country, from the kingdom of Barca to Gaza, is either overflowed by the river, or capable of being so; which thus fertilizes in a high degree a tract of country seemingly devoted to perpetual barrenness on account of the want of rain and the heat of the climate.

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gypt ex-
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According to the testimonies of both Mr Bruce and M. Volney, the coast of Egypt is so extremely low, that it cannot be discovered at sea till the mariners come within a few leagues of it. In ancient times the sailors pretended to know when they approached this country by a kind of black mud brought up by their sounding-line from the bottom of the sea: but this notion, though as old as the days of Herodotus, has been discovered to be a mistake by Mr Bruce; who found the mud in question to arise while the vessel was opposite to the deserts of Barca. All along the coast of Egypt a strong current sets to the eastward.

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In former times Egypt was much celebrated for its fertility; and there is great reason to believe, that were the same pains bestowed upon the cultivation of the ground, and the distribution of the waters of the Nile in a proper manner, the same fertility would still be found to remain. The cause of decrease in the produce of Egypt we shall describe in the words of M. Savary. "The canals," says he, speaking of the Delta, "which used to convey fertility with their waters, are now filled. The earth no longer watered, and continually exposed to the burning ardour of the sun, is converted into a barren sand. In those places where formerly were seen rich fields and flourishing towns, on the Pelusiac, the Taroitic, and the Mendesian branches, which all strike out from the canal of Damietta, nothing is to be found at this day but a few miserable hamlets, surrounded by date-trees and by deserts. These once navigable canals are now no more than a vain resemblance of what they were: they have no communication with the lake Menzall, but what is merely temporary, on the swelling of the Nile; they are dry the remainder of the year. By deepen-

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ing them by removing the mud deposited by the river since the Turks have made themselves masters of Egypt, the country they pass through would be again fertilized, and the Delta recover a third of its greatness."

Concerning this island, it has been the opinion of a great many, even from very ancient times, that it was produced by the mud brought down by the inundations of the Nile; and this opinion we find adopted in the strongest manner by M. Savary. His account of the supposed rise of the Delta, and indeed of the greatest part of Egypt, is to the following purpose. In those early ages where history has not fixed any epoch, a certain people descended from the mountains near the cataracts, into the valley overflowed by the Nile, and which was then an uninhabitable morass overgrown with reeds and canes. In what manner, or from what motive, these people were induced to descend from their ancient habitations to such a place, or how they found means to penetrate into a morass which he expressly tells us was *impenetrable*, we are not informed, neither is it to our present purpose to inquire. At that time, however, the sea bathed the feet of those mountains where the pyramids are built, and advanced far into Libya. It covered also part of the Isthmus of Suez, and every part of what we now call the Delta formed a great gulph. After many ages the Egyptians, by what means is unknown, at least not specified by our author (though they ought to have been so, as the country it seems was then overflowed not only by the river but by the ocean), formed canals to carry off the stagnant waters of the Nile; opposed strong dykes to its ravages; and, tired of dwelling in the caverns of rocks, built towns and cities upon spots elevated either by nature or art. Already the river was kept within its bounds, the habitations of men were out of the reach of its inundations, and experience had taught the people to foresee and announce them. One of the kings of Egypt undertook to change the course of the river. After running 150 leagues between the barriers already mentioned, meeting with an unsurmountable obstacle to the right, it turned suddenly to the left; and taking its course to the southward of Memphis, it spread its waters thro' the sands of Libya. The prince we speak of caused a new bed to be dug for it to the east of Memphis; and by means of a large dyke obliged it to return between the mountains, and discharge itself into the gulph that bathes the rock on which the castle of Cairo is built. The ancient bed of the river was still to be seen in the time of Herodotus, and may even be traced at this day across the deserts, passing to the westward of the lakes of Natrum. The Arabs still bestow upon it the name of *Bahr Bela ma*, "or sea without water," and it is now almost choaked up. To the labours of this monarch Egypt is indebted for the Delta. A reflux of the sea was occasioned by the enormous weight of the waters of the Nile, which precipitated themselves into the bottom of the gulph. Thus the sands and mud carried along with them were collected into heaps; and thus the Delta, at first very inconsiderable, rose out of the sea of which it repelled the limits. It was a gift of the river, and it has since been defended from the attacks of the ocean by raising dykes around it. Five hundred years before the Trojan war, according to He-

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Egypt. Herodotus, the Delta was in its infancy; eight cubits of water being then sufficient to overflow it. Strabo tells us, that boats passed over it from one extremity to the other; and that its towns, built upon artificial eminences, resembled the islands of the Egean Sea. At the time that Herodotus visited this country, 15 cubits were necessary to cover all the Lower Egypt; but the Nile then overflowed the country for the space of two days journey to the right and left of the island. Under the Roman empire, 16 cubits performed the same effect. When the Arabs came to have the dominion, 17 cubits were requisite; and at this day 18 are necessary to produce a plentiful crop; but the inundation stops at Cairo and the neighbouring country, without being extended over the Lower Egypt. Sometimes, however, the Nile rises to 22 cubits; and the cause of this phenomenon is the mud for so many years accumulated on the island. Here, in the space of 3284 years, we see the Delta elevated 14 cubits. Our author wrote in 1777, and informs us that he twice made the tour of the island during the time of the inundation. "The river (says he) flowed in full streams in the great branches of Rosetta and Damietta, as well as in those which pass through the interior part of the country; but it did not overflow the lands, except in the lower parts, where the dykes were pierced for the purpose of watering the plantations of rice. We must not, however, imagine, as several travellers pretend, that this island will continue to rise, and that it will become unfruitful. As it owes its increase to the annual settling of the mud conveyed thither by the Nile, when it ceases to be overflowed it will no longer increase in height, for it is demonstrated that culture is not sufficient to raise land.

"It is natural to imagine that the Delta has increased in length as well as in height; and of this we may look upon the following fact to be a remarkable proof. Under the reign of Psammiticus, the Milesians, with 30 vessels, landed at the mouth of the Bolbitine branch of the Nile, now called that of Rosetta, where they fortified themselves. There they built a town called *Metelis*, the same as *Faouie*, which, in the Coptic vocabularies, has preserved the name of *Messil*. This town, formerly a sea-port, is now nine leagues distant from the sea; all which space the Delta has increased in length from the time of Psammiticus to the present. Homer, in his *Odyssey*, puts the following words in the mouth of Menelaus. "In the stormy sea which washes Egypt, there is an island called *Pharos*. Its distance from the shore is such, that a vessel with a fair wind may make the passage in a day." From the way in which he speaks of this island in other places, also, we may suppose that the island of *Pharos*, in his time, was not less than 20 leagues distant from the Egyptian coast, though now it forms the port of Alexandria; and this sentiment is confirmed by the most ancient writers.

"What prodigious changes great rivers occasion on the surface of the globe! How they elevate, at their mouths, islands which become at length large portions of the continent! It is thus that the Nile has formed almost all the Lower Egypt, and created out of the waters the Delta, which is 90 leagues in circumference. It is thus that the Meander, constantly repelling the waves of the Mediterranean, and gradually fill-

ing up the gulph into which it falls, has placed in the middle of the land the town of Miletis, formerly a celebrated harbour. It is thus that the Tigris and the Euphrates, let loose from the Armenian hills, and sweeping with them in their course the sands of Mesopotamia, are imperceptibly filling up the Persian gulph."

These are the reasons assigned by M. Savary for ¹³⁰ Mr Bruce's thinking that the Delta, as well as the greatest part of the Lower Egypt, have been produced by the Nile; but this opinion is violently contested by other late travellers, particularly Mr Bruce, who has given a pretty long dissertation upon it, as well as many occasional remarks through the course of his work. He begins with observing, 1. That the country of Egypt is entirely a valley bounded by rugged mountains; whence it might seem natural to imagine that the Nile, overflowing a country of this kind, would be more ready to wash away the soil than to add to it. 2. It is observed by Dr Shaw, and the same is confirmed by our author, that there is a gentle slope from the middle of the valley to the foot of the mountains on each side; so that the middle, in which is the channel of the Nile, is really higher than any other part of the valley. Large trenches are cut across the country from the channel of the river, and at right angles with it, to the foot of the mountains. 3. As the river swells, the canals become filled with water, which naturally descending to the foot of the mountains, runs out at the farther end, and overflows the adjacent level country. 4. When the water, having attained the lowest ground, begins to stagnate, it does not acquire any motion by reason of the canal's being at right angles with the channel of the Nile, unless in the case of excessive rains in Ethiopia, when the water by its regurgitation again joins the stream. In this case, the motion of the current is communicated to the whole mass of waters, and every thing is swept away by them into the sea. 5. It has been the opinion of several authors, that there was a necessity for measuring the height of the inundation on account of the quantity of mud brought down annually by the waters, by which the land-marks were so covered, that the proprietors could not know their own grounds after the river subsided. But whatever might be the reason of this covering of the land-marks in ancient times, it is certain that the mud left by the Nile could not be so in the time of Herodotus, or during any period of time assigned by that historian; for he assigns only one foot of increase of soil throughout Egypt in an hundred years from the mud left by the river: the increase during one year, therefore, being only the hundredth part of a foot, could not cover any land-mark whatever. Besides, the Egyptian lands are at this day parted by huge blocks of granite, which frequently have gigantic heads at the ends of them; and these could not, at the rate mentioned by Herodotus, be covered in several thousand years. 6. The Nile does not now bring down any great quantity of mud; and it is absurd to suppose that it can at present bring down as much as it did soon after the creation, or the ages immediately succeeding the deluge. Throughout Abyssinia, according to the testimony of our author, the channel of every torrent is now worn to the bare rock, and almost every rivulet runs in a hard stony bed, all the loose earth being long ago washed away; so that an annual

Egypt. and equable increase of the earth from the sediment of the waters is impossible. 7. Our author made a great number of trials of the water of the Nile during the time of its inundation in different places. At Bab-boch, when just coming down from the cultivated parts of Abyssinia, and before it enters Sennaar, the sediment is composed of fat earth and sand, and its quantity is exceedingly small. At the junction of the Nile and Astaboras the quantity of sediment is very little augmented; consisting still of the same materials, but now mostly sand. At Syene the quantity of sediment was almost nine times greater than before; but was now composed almost entirely of sand, with a very small quantity of black earth. The conclusion of our author's experiments, however, is different from what we should have been led to expect from those just mentioned. "The experiment at Rosetta (says he) was not so often repeated as the others: but the result was, that in the strength of the inundation the sediment consisted mostly of sand; and, towards the end, was much the greater part earth. I think these experiments conclusive, as neither the Nile coming fresh from Abyssinia, nor the Atbara, though joined by the Mareb, likewise from the same country, brought any great quantity of soil from thence."

8. Our author goes on to observe, that had the Nile brought down the quantities of mud which it has been said to do, it ought to have been most charged with it at Syene; as there it contained the whole that was to be conveyed by it into Egypt. Instead of this, however, the principal part of the sediment at this place was sand; and this is very naturally accounted for from the vast quantities of sand taken up by the winds in the deserts between Gooz and Syene. Here our traveller frequently saw vast pillars of this kind of sand, which is so fine and light as to form an impalpable powder, traversing the desert in various directions. Many of these were driven upon the river; and when it became calm in the evening, fell down into it entirely; thus affording materials for the many sandy islands to be met with in the Nile.

9. Mr Bruce adopts the opinion of those who suppose that there has been a continual decrease of water since the creation of the world. In this case, therefore, if the land of Egypt had been continually increasing in height while the water that was to cover it decreased; there must have been frequent famines on account of the want of a sufficient inundation. But so far is this from being the case, that, according to the testimony of several Arabian MSS. there had not, when Mr Bruce was in Egypt, been one scarce season from the lowness of the inundation for 34 years; tho' during the same space they had three times experienced a famine by too great an abundance of water, which carried away the millet.

10. If there had been such an increase of land as Herodotus and others suppose, it must now have been very perceptible in some of the most ancient public monuments. This, however, is by no means the case. The base of every obelisk in Upper Egypt is to this day quite bare and visible. Near Thebes there are still extant two Colossal statues, plainly designed for nilometers, and which ought by this time to have been almost covered with earth; but notwithstanding the length of time these have remained there, they are still bare to the very base.

The strongest argument which the advocates for the increase of land of Egypt can make use of is, that the measures by which the quantity of inundation is determined are smaller now than in former times; and these small measures are said to have been introduced by the Saracens. On this Mr Bruce very justly observes, that such an expedient could not have answered any good purpose; as no decrease of the measure could have augmented the quantity of corn produced by the ground. M. Savary observes, that, to render his calculation concerning the growth of land in Egypt absolutely exact, it would be necessary to determine the precise length of the Greek, Roman, and Arabian cubit; and even to know the different alterations which that measure had undergone among these people: But this nicety he thinks needless; looking upon the general fact to be fully established by what he had said before. Mr Bruce, however, has treated the subject with much greater accuracy. He observes, that from the situation of Canopus, the distance betwixt Egypt and Cyprus, and the extension of the land to the northward, it appears that no addition of any consequence has been made to it for 3000 years past. The only argument left for the increase of land therefore must be taken from the nilometer. The use of this instrument was to determine the quantity of inundation, that so it might be known whether the crop would be sufficient to enable the people to pay the taxes exacted of them by the sovereign or not. The first step was to know what space of ground was overflowed in a given number of years; and this being determined by mensuration, the next thing was to ascertain the produce of the ground upon an average. Thus becoming acquainted with the greatest and least crops produced, together with the exact extent of ground overflowed, they were furnished with all the necessary principles for constructing a nilometer; and nothing now remained but to erect a pillar in a proper place, and divide it exactly into cubits. This was accordingly done; the pillar was first divided into cubits and these again were subdivided into digits. The first division of this kind was undoubtedly that mentioned in scripture, and called the *cubit of a man*; being the length of the arm from the middle of the round bone in the elbow to the point of the middle finger; a measure still in use among all rude nations. As no standard could be found by which this measure might be exactly determined, authors have differed very much concerning the true length of the cubit when reduced to our feet and inches. Dr Arbuthnot reckons two cubits mentioned in scripture; one of them containing one foot nine inches and $\frac{888}{1000}$ of an inch; the other one foot and $\frac{824}{1000}$ of a foot; but Mr Bruce is of opinion that both of these are too large. He found, by mensuration, the Egyptian cubit to be exactly one foot five inches and three-fifths of an inch; and Herodotus mentions, that in his time the cubit used for determining the increase of the Nile was the Samian cubit, about 18 of our inches. The latter also informs us, that in the time of Moeris, the minimum of increase was 8 cubits, at which time all Egypt below the city of Memphis was overflowed; but that in his time 16 or at least 15 cubits were necessary to produce the same effect. But to this account Mr Bruce objects, that Herodotus could have no certain information concerning the nilometer, because he himself says that the

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priests, who alone had access to it, would tell him nothing of the matter. Herodotus also informs us, that in the time of Moeris, great lakes were dug to carry off the waters of the inundation; and this superfluous quantity Mr Bruce supposes to have been conveyed into the desert for the use of the Arabs, and that by such a vast drain the rise of the water on the nilometer would undoubtedly be diminished. But even granting that there was such a difference between the rise of the water in the time of Moeris and in that of Herodotus, it does not appear that any thing like it has appeared ever since. Strabo, who travelled into Egypt 400 years after the time of Herodotus, found that eight cubits were then the minimum, as well as in the time of Moeris. From some passages in Strabo, however, it appears that it required a particular exertion of industry to cause this quantity of water produce a plentiful crop; but there is not the least reason to suppose, that the very same industry was not necessary in the time of Moeris; so that still there is not any increase of land indicated by the nilometer. About 100 years afterwards, when the emperor Adrian visited Egypt, we are informed from unquestionable authority, that 16 cubits were the minimum when the people were able to pay their tribute; and in the fourth century, under the emperor Julian, 15 cubits were the standard; both which accounts correspond with that of Herodotus. Lastly, Procopius, who lived in the time of Justinian, informs us, that 18 cubits were then requisite for a minimum.

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From these accounts, so various and discordant, it is obvious that no certain conclusion can be drawn. It is not indeed easy to determine the reason of this difference in point of fact. The only conjecture we can offer is, that as it appears that by proper care a smaller quantity of water will answer the purpose of producing a plentiful crop, so it is not unreasonable to suppose that at different periods the industry of the people has varied so much as to occasion the disagreement in question. This would undoubtedly depend very much upon their governor; and indeed Strabo informs us that it was by the care of the governor Petronius, that such a small quantity of water was made to answer the purpose. The conclusion drawn by Mr Bruce from the whole of the accounts above related, is, that from them it is most probable that no increase of land has been indicated by the nilometer from the time of Moeris to that of Justinian.

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Nor in
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dern times.

On the conquest of Egypt by the Saracens, their barbarous and stupid khalif destroyed the nilometer, causing another to be built in its stead, and afterwards fixed the standard of paying tribute considerably below what it had usually been. The Egyptians were thus kept in continual terror, and constantly watched the new nilometer to observe the gradual increase or decrease of the water. On this he ordered the new nilometer to be destroyed, and another to be constructed, and all access to it to be denied to the people. Which prohibition is still continued to Christians; though our author found means to get over this obstacle, and has given a figure of the instrument itself. That the people might not, however, be supposed to remain in total ignorance of their situation, he commanded a proclamation to be daily made concerning the height of the water, but in such an unintelligible manner that nobody was made any wiser; nor, according to our au-

thor, is the proclamation understood at this day. From his own observations, however, Mr Bruce concludes, that 15 cubits are now the minimum of inundation, and as this coincides with the accounts of it in the times of Herodotus and Adrian, he supposes with great probability, that the same quantity of water has been necessary to overflow this country from the earliest accounts to the present time.

It now remains only to take notice of what is said by M. Savary concerning the former distance of the island of Pharos from the land to which it is now joined. With regard to his other assertions concerning the city of Metelis having been once a sea-port, M. Volney proves that he has quoted Strabo unfairly, and consequently no stress is to be laid upon them. The principal, indeed the only, evidence therefore which remains, is the passage already quoted from Homer, viz. that "the island of Pharos is as far distant from one of the mouths of the Nile as a vessel can sail in one day before the wind." "But (says M. Volney) when Homer speaks of the distance of this island, he does not mean its distance from the shore opposite, as that traveller (M. Savary) has translated him, but from the land of Egypt and the river Nile. In the second place, by a day's sail we must not understand that indefinite space which the vessels, or rather the boats, of the ancient Greeks, could pass through in a day; but an accurate and determined measure of 540 stadia. This measure is ascertained by Herodotus, and is the precise distance between Pharos and the Nile, allowing, with M. d'Anville, 27,000 toises to 540 stadia. It is therefore far from being proved, that the increase of the Delta or of the continent was so rapid as has been represented; and, if we were disposed to maintain it, we should still have to explain how this shore, which has not gained half a league from the days of Alexander, should have gained eleven in the far shorter period from the time of Menelaus to that conqueror. The utmost extent of the encroachment of this land upon the sea, however, may be learned from the words of Herodotus; who informs us, that "the breadth of Egypt, along the sea-coast, from the gulph of Plinthine to the lake Serbonis near mount Casius, is 3600 stadia; and its length from the sea to Heliopolis 1500 stadia." Allowing therefore the stadium of Herodotus to be between 50 and 51 French toises, the 1500 stadia just mentioned are equal to 76,000 toises; which, at the rate of 57,000 to a degree, gives one degree and near 20 minutes and an half. But from the astronomical observations of M. Niebuhr, who travelled for the king of Denmark in 1761, the difference of latitude between Heliopolis, now called Matarea, and the sea, being one degree 29 minutes at Damietta, and one degree 24 minutes at Rosetta, there is a difference on one side of three minutes and an half, or a league and an half encroachment; and eight minutes and an half, or three leagues and an half on the other."

Thus the dispute concerning the augmentation of the land of Egypt by the Nile seems to be absolutely decided; and the encroachments of it on the sea so trifling, that we may justly doubt whether they exist, or whether we are not entirely to attribute the apparent differences to those which certainly take place betwixt the ancient and modern mensuration. M. Volney gives a very particular description of the face of the country; but takes notice of the inconveniences under which travellers labour in this country, by which it is rendered extremely difficult

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ry's opinion
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to say any thing certain with regard to the nature of the soil or mineral productions. These arise from the barbarity and superstition of the people, who imagine all the Europeans to be magicians and forcerers, who come by their magic art to discover the treasures which the genii have concealed under the ruins. So deep rooted is this opinion, that no person dares walk alone in the fields, nor can he find any one willing to accompany him; by which means he is confined to the banks of the river, and it is only by comparing the accounts of various travellers that any satisfactory knowledge can be acquired.

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try.

According to this author, the entrance into Egypt at Rosetta presents a most delightful prospect, by the perpetual verdure of the palm-trees on each side, the orchards watered by the river, with orange, lemon, and other fruit-trees, which grow there in vast abundance; and the same beautiful appearance is continued all the way to Cairo. As we proceed farther up the river, he says, that nothing can more resemble the appearance of the country than the marshes of the lower Loire, or the plains of Flanders: instead, however, of the numerous trees and country-houses of the latter, we must imagine some thin woods of palms and fycamores, with a few villages of mud-walled cottages, built on artificial mounds. All this part of Egypt is very low and flat, the declivity of the river being so gentle, that its waters do not flow at a greater rate than one league in an hour. Throughout the country nothing is to be seen but palm-trees, single or in clumps, which become more rare in proportion as you advance; with wretched villages composed of huts with mud-walls, and a boundless plain, which at different seasons is an ocean of fresh water, a miry morass, verdant field, or a dusty desert; and on every side an extensive and foggy horizon, where the eye is wearied and disgusted. At length, towards the junction of the two branches of the river, the mountains of Cairo are discovered on the east; and to the south-west three detached masses appear, which from their triangular form are known to be the pyramids. We now enter a valley which turns to the southward, between two chains of parallel eminences. That to the east, which extends to the Red Sea, merits the name of a mountain from its steepness and height, as well as that of a desert from its naked and savage appearance. Its name in the Arabic language is *Mokattam*, or the *beaten-mountain*. The western is nothing but a ridge of rock covered with sand, which has been very properly termed a *natural mound* or *causeway*. In short, that the reader may at once form an idea of this country, let him imagine on one side a narrow sea and rocks; on the other, immense plains of sand; and in the middle, a river, flowing through a valley of 150 leagues in length and from three to seven wide, which at the distance of 30 leagues from the sea separates into two arms; the branches of which wander over a soil almost free from obstacles, and void of declivity.

From comparing his own observations with those of other travellers, our author concludes, that the basis of all Egypt from *Asouan* (the ancient Syene) to the Mediterranean, is a continued bed of calcareous stone of whitish hue, and somewhat soft, containing the same kind of shells met with in the adjacent seas, and which forms the immense quarries extending from Saouadi to

Manfalout for the space of more than 25 leagues, according to the testimony of Father Sicard.

Mr Bruce, however, gives us a much more particular account of the sources from whence were derived the vast quantities of marble met with in the remains of ancient buildings in this country. These he discovered during his journey from Kenne to Cossair on the Red Sea, before he took his expedition to Abyssinia. He gives a most dismal idea of the deserts through which he passed. What houses he met with were constructed, like those M. Volney mentions, of clay, being no more than six feet in diameter, and about ten in height. The mountains were the most dreary and barren that can be imagined; and the heat of the sun so great, that two sticks rubbed together only for half a minute would take fire and flame. In these burning regions no living creature was to be met with, even the poisonous serpents and scorpions not being able to find subsistence. The first animal he saw was a species of ants in a plain called *Hamra* from the purple colour of its sand; and it was remarkable that these insects were of the same colour with the sand itself. No water was any where to be met with on the surface; though at a place called *Legeta* there were some draw-wells, the water of which was more bitter than foot itself. At Hamra the porphyry mountains and quarries begin, the stone of which is at first soft and brittle; but the quantity is immense, as a whole day was taken up in passing by them. These porphyry mountains begin in the latitude of nearly 24 degrees, and continue along the coast of the Red Sea to about 22° 30', when they are succeeded by the marble mountains; these again by others of alabaster, and these last by basaltic mountains. From the marble mountains our author selected twelve kinds, of different colours, which he brought along with him. Some of the mountains appeared to be composed entirely of red and others of green marble, and by their different colours afforded an extraordinary spectacle. Not far from the porphyry mountains the cold was so great, that his camels died on his return from Abyssinia, though the thermometer stood no lower than 42°.

Near to Cossair he discovered the quarries whence the ancients obtained those immense quantities of marble with which they constructed so many wonderful works. The first place where the marks of their operations were very perceptible, was a mountain much higher than any they had yet passed, and where the stone was so hard that it did not even yield to the blows of a hammer. In this quarry he observed that some ducts or channels for conveying water terminated; which, according to him, shows that water was one of the means by which these hard stones were cut. In four days, during which our author travelled among these mountains, he says, that he had "passed more granite, porphyry, marble, and jasper, than would build Rome, Athens, Corinth, Syracuse, Memphis, Alexandria, and half a dozen such cities." It appeared to him that the passages between the mountains and which he calls *defiles*, were not natural but artificial openings; where even whole mountains had been cut out, in order to preserve a gentle slope towards the river. This descent our author supposes not to be above one foot in 50; so that the carriages must have gone very easily, and rather required something to re-

Egypt.

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Mr Bruce's
account of
the deserts,
marble,
mountains,
&c.

^{Egypt.} tard their velocity than any force to pull them forward. Concerning the mountains in general, he observes, that the porphyry is very beautiful to the eye, and is discovered by a fine purple sand without any gloss. An unvariegated marble of a green colour is generally met with in the same mountain; and where the two meet, the marble becomes soft for a few inches, but the porphyry retains its hardness. The granite has a dirty brown appearance, being covered with sand; but on removing this, it appears of a grey colour with black spots, with a reddish cast all over it. The granite mountains lie nearer to the Red Sea, and seem to have afforded the materials for Pompey's pillar. The redness above mentioned seems to go off on exposure to the air; but reappears on working or polishing the stone farther. The red marble is next to the granite, though not met with in the same mountain. There is also a red kind with white veins, and vast quantities of the common green serpentine. Some samples of that beautiful marble named *Isabella* were likewise observed; one of them of that yellowish cast called *quaker-colour*, the other of the bluish kind named *dove-colour*. The most valuable kind is that named *verde antico*, which is found next to the Nile in the mountains of serpentine. It is covered by a kind of blue fleaky stone, somewhat lighter than a slate, more beautiful than most kinds of marble, and when polished having the appearance of a volcanic lava. In these quarries the verde antico had been uncovered in patches of about 20 feet square. There were small pieces of African marble scattered about in several places, but no rocks or mountains of it; so that our author conjectures it to lie in the heart of some other kind. The whole is situated on a ridge with a descent to the east and west; by which means it might easily be conveyed either to the Nile or Red Sea, while the hard gravel and level ground would readily allow the heaviest carriages to be moved with very little force.

¹³⁷
Of a supposed emerald mine.

Travellers have talked of an emerald mine in these deserts; but from the researches of Mr Bruce, it does not appear to have any existence. In the Red Sea indeed, in the latitude of $25^{\circ} 3'$, at a small distance from the south-western coast, there is an island called the *Mountain of Emeralds*; but none of these precious stones are to be met with there. Here, as well as on the continent, there were found many pieces of a green pellucid substance; but veined, and much softer than rock-crystal, though somewhat harder than glass. A few yards up the mountain he found three pits, which are supposed to have been the mines whence the ancients obtained the emeralds; but though many pieces of the green substance above mentioned were met with about these pits, no signs of the true emerald could be perceived. This substance, however, he conjectures to have been the *smaragdus* of the Romans. In the mountains of Cosseir, as well as in some places of the deserts of Nubia, our author found some rocks exactly resembling petrified wood.

¹³⁸
Stones of a curious appearance.

The only metal said by the ancients to be produced in Egypt is copper. On the road to Suez are found great numbers of those stones called *Egyptian flints* and *pebbles*, though the bottom is a hard, calcareous, and sonorous stone. Here also M. Volney tells us, that the stones above mentioned, and which resemble petrified wood, are to be met with. These, he says, are

in the form of small logs cut slanting at the ends, and might easily be taken for petrifications, though he is convinced that they are real minerals.

F. Sicard mentions two lakes, from the water of which is produced annually a great quantity of salt containing much mineral alkali; and M. Volney informs us, that the whole soil of this country is impregnated with salt; so that, upon digging to some depth in the ground, we always meet with brackish water impregnated in some degree with the mineral alkali as well as with common salt. The two lakes mentioned by Sicard are situated in the desert to the west of the Delta; and are three or four leagues in length, and about a quarter of a league in breadth, with a solid and stony bottom. For nine months in the year they are without water; but in the winter time there oozes out of the earth a reddish violet-coloured water, which fills the lakes to the height of five or six feet. This being evaporated by the return of the heat, there remains a bed of salt two feet thick and very hard which is broken in pieces with iron bars; and no less than 30,000 quintals are procured every year from these lakes. So great is the propensity of the Egyptian soil to produce salt, that even when the gardens are overflowed for the sake of watering them, the surface of the ground, after the evaporation and absorption of the water, appears glazed over with salt. The water found in the wells contains mineral alkali, marine salt, and a little nitre. M. Volney is of opinion, that the fertile mould of Egypt, which is of a black colour, differs essentially from that of the other parts; and is derived from the internal parts of Ethiopia along with the waters of the Nile. This seems to contradict what he had before advanced against M. Savary concerning the increase of the land of Egypt by means of the waters of this river: but there is no reason at all to suppose this kind of earth to be of a foreign origin; it being always the result of vegetation and cultivation.

¹³⁹
Salt lakes.

Even the most barren and sandy spots in the world, if properly watered, and such vegetables planted in them as would grow there, in time would be covered with this black earth as well as others: and of this kind of artificial formation of soil travellers give us a remarkable instance in the garden of the monks at Mount Sinai, where the country is naturally as barren as in any place of the world. "The monks of Sinai (says Dr Shaw), in a long process of time, have covered over with dung and the sweepings of their convent near four acres of naked rocks; which produce as good cabbage, roots, salad, and all kinds of pot-herbs, as any soil and climate whatsoever. They have likewise raised olive, plum, almond, apple, and pear trees, not only in great numbers, but of excellent kinds. The pears particularly are of such esteem at Cairo, that there is a present of them sent every year to the bashaw and persons of the first quality. Neither are their grapes inferior in size and flavour to any whatsoever: it being fully demonstrated, by what this little garden produces, how far an indefatigable industry can prevail over nature; and that several places are capable of culture and improvement which were intended by nature to be barren, and which the lazy and slothful have always suffered to be so."

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Vegetable mould of Egypt not originally derived from Ethiopia.

From this general account of the country, we may reasonably conclude, that the natural fertility of E-

gypt

¹⁴¹ **Egypt.** Egypt is not diminished in modern times, provided the same pains were taken in the cultivation of it as formerly; but this is not to be expected from the present degenerate race of inhabitants. "The Delta (says Mr Savary) is at present in the most favourable state for agriculture. Washed on the east and west by two rivers formed by the division of the Nile, each of which is as large and more deep than the Loire, intersected by innumerable rivulets; it presents to the eye an immense garden, all the different compartments of which may be easily watered. During the three months that the Thebais is under water, the Delta possesses fields covered with rice, barley, vegetables, and winter fruits. It is also the only part of Egypt where the same field produces two crops of grain within the year, the one of rice, the other of barley."

¹⁴² **Method of purifying and cooling the water in Egypt.**

The only cause of all this fertility is the Nile, without which the whole country would soon become an uninhabitable desert, as rain falls very seldom in this part of that world. It flows with a very gentle stream through the flat country, and its waters are very muddy, so that they must have time to settle, or even require filtration before they can be drunk. For purifying the water, the Egyptians, according to M. Volney, use bitter almonds, with which they rub the vessel containing it, and then the water becomes light and good; but on what principle this ingredient acts, we cannot pretend to determine. Unglazed earthen vessels filled with water are kept in every apartment; which by a continual evaporation through their porous substance, render the contained fluid very cool even in the greatest heats*. The river continues muddy for six months; and during the three which immediately precede the inundation, the stream being reduced to an inconsiderable depth, becomes heated, green, fetid, and full of worms. The Egyptians in former times paid divine honours to the Nile, and still hold it in great veneration. They believe its waters to be very nourishing, and that they are superior to any in the world; an opinion very excusable in them, as they have no other, and large draughts of cold water are among their highest luxuries.

* See Evaporation.

¹⁴³ **Of the inundation of the Nile.**

This river, swelled by the rains which fall in Abyssinia, begins to rise in Egypt about the month of May; but the increase is inconsiderable till towards the end of June, when it is proclaimed by a public crier thro' the streets of Cairo. About this time it has usually risen five or six cubits; and when it has risen to 16, great rejoicings are made, and the people cry out *Waf-fah Allah*, that is, that God has given them abundance. This commonly takes place about the latter end of July, or at farthest before the 20th of August; and the sooner it takes place, so much the greater are the hopes of a good crop. Sometimes, though rarely, the necessary increase does not take place till later. In the year 1705, it did not swell to 16 cubits till the 19th of September; the consequence of which was, that the country was depopulated by famine and pestilence.

We may easily imagine that the Nile cannot overflow the whole country of itself in such a manner as to render it fertile; for which reason there are innumerable canals cut from it across the country, as has already been observed, by which the water is conveyed to distant places, and almost every town or village

has one of these canals. In those parts of the country where the inundation does not reach, and where more water is required than it can furnish, as for watering of gardens, they must have recourse to artificial means for raising it from the river. In former times they made use of Archimedes's screw*; but that is now disused, and in place of it they have chosen the Persian wheel. This is a large wheel turned by oxen, having a rope hung with several buckets which fill as it goes round, and empty themselves into a cistern at the top. Where the banks of the river are high, they frequently make a basin in the side of them, near which they fix an upright pole, and another with an axle across the top of that, at one end of which they hang a great stone, and at the other a leathern bucket; this bucket being drawn down into the river by two men, is raised by the descent of the stone, and emptied into a cistern placed at a proper height. This kind of machine is used chiefly in the upper parts of the country, where the raising of water is more difficult than in places near the sea. When any of their gardens or plantations want water, it is conveyed from the cisterns into little trenches, and from thence conducted all round the beds in various rills, which the gardener easily stops by raising the mould against them with his foot, and diverts the current another way as he sees occasion.

The rise of the inundation is measured, as has already been observed, by an instrument adapted for the purpose, and called *mikeas*, which we translate *nilometer*. Mr Bruce informs us, that this is placed between Geeza and Cairo, on the point of an island named *Rhoda*, about the middle of the river, but somewhat nearer to Geeza. It is a round tower with an apartment, in the middle of which is a cistern neatly lined with marble. The bottom of this cistern reaches to that of the river, and there is a large opening by which the water has free access to the inside. The rise of the water is indicated by an octagonal column of blue and white marble, on which are marked 20 peeks or cubits of 22 inches each. The two lower most of these have no subdivisions; but each of the rest is divided into 24 parts call *digits*; the whole height of the pillar being 36 feet 8 inches.

¹⁴⁴ **Nilometer described.**

When the river has attained its proper height, all the canals are opened, and the whole country laid under water. During the time of the inundation a certain vortical motion of the waters takes place; but notwithstanding this, the Nile is so easily managed, that many fields lower than the surface of its waters are preserved from injury merely by a dam of moistened earth not more than eight or ten inches in thickness. This method is made use of particularly in the Delta when it is threatened with a flood.

¹⁴⁵ **Of the canals by which the water is conveyed, &c.**

As the Nile does not always rise to an height sufficient for the purposes of agriculture, the former sovereigns of Egypt were at vast pains to cut proper canals in order to supply the deficiency. Some of these are still preserved; but great numbers are rendered useless through the indolence or barbarity of their successors. Those which convey the water to Cairo, into the province of Fayoom, and to Alexandria, are best taken care of by government. The last is watched by an officer appointed for that purpose, whose office it is to hinder the Arabs of Bachria, who receive this superfluous water, from turning it off before Alexandria be-

pro-

¹⁴⁶
Egypt. provided for, or opening it before the proper time, which would hinder the increase of the river. In like manner, that which conveys the water to Fayoom is watched, and cannot be opened before that of Cairo, which is called the *Canal of Trajan*. A number of other canals, only taken care of by those who derive advantage from them, proceed from that arm of the Nile which runs to Damietta, and fertilize the province of Sharkia; which, making part of the isthmus of Suez, is the most considerable of Egypt, and the most capable of a great increase of cultivation. The plains of Gaza which lie beyond, and are possessed by the Arabs, would be no less fertile, were it not for the excessive inclination these people have to destroy, so that they make war even with the spontaneous productions of the earth. A number of other canals run through the Delta; and the vestiges of those which watered the provinces to the eastward and westward, show that in former times these were the best cultivated parts of Egypt. "We may also presume (says the Baron de Tott), from the extent of the ruins of Alexandria, the construction of the canal, and the natural level of the lands which encompass the lake Mareotis, and extend themselves westward to the kingdom of Barca, that this country, at present given up to the Arabs, and almost desert, was once sufficiently rich in productions of every kind to furnish the city of Alexandria with its whole subsistence."

¹⁴⁶
Air and
climate of
Egypt.

The air and climate of Egypt are extremely hot, not only from the height of the sun, which in summer approaches to the zenith, but from the want of rain and from the vicinity of those burning and sandy deserts which lie to the southward. In the months of July and August, according to M. Volney, Reamur's thermometer stands, even in the most temperate apartments, at the height of 24 or 25 degrees above the freezing point; and in the southern parts it is said to rise still higher. Hence, he says, only two seasons should be distinguished in Egypt, the cool and the hot, or spring and summer. The latter continues for the greatest part of the year, viz. from March to November or even longer; for by the end of February the sun is intolerable to an European at nine o'clock in the morning. During the whole of this season, the air seems to be inflamed, the sky sparkles, and every one sweats profusely, even without the least exercise, and when covered with the lightest dress. This heat is tempered by the inundation of the Nile, the fall of the night-dews, and the subsequent evaporation; so that some of the European merchants, as well as the natives, complain of the cold in winter. The dew we speak of does not fall regularly throughout the summer, as with us; the parched state of the country not affording a sufficient quantity of vapour for this purpose. It is first observed about St John's day (June 24th), when the river has begun to swell, and consequently a great quantity of water is raised from it by the heat of the sun, which being soon condensed by the cold of the night air, falls down in copious dews.

It might naturally be imagined, that as for three months in the year Egypt is in a wet and marshy situation, the excessive evaporation and putrefaction of the stagnating waters would render it very unhealthy. But this is by no means the case. The great dryness

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of the air makes it absorb vapours of all kinds with the utmost avidity; and these rising to a great height, are carried off by the winds either to the southward or northward, without having time to communicate any of their pernicious effects. This dryness is so remarkable in the internal parts of the country, that flesh meat exposed to the open air does not putrefy even in summer, but soon becomes hard and dry like wood. In the deserts there are frequently dead carcases thus dried in such a manner, and become so light, that one may easily lift that of a camel with one hand. In the maritime parts, however, this dryness of the air is not to be expected. They discover the same degree of moisture which usually attends such situations. At Rosetta and Alexandria, iron cannot be exposed to the air for 24 hours without rusting. According to M. Volney, the air of Egypt is also strongly impregnated with salts; for which opinion he gives the following reason. "The stones are corroded by natrum (mineral alkali), and in moist places long crystallizations of it are to be found, which might be taken for salt-petre. The wall of the Jesuits garden at Cairo, built with earth and bricks, is every where covered with a crust of this natrum as thick as a crown-piece: and when this garden has been overflowed by the waters of the kalidj (canal), the ground, after they have drained off, appears sparkling on every side with crystals, which certainly were not brought thither by the water, as it shows no sign of salt either to the taste or by distillation."—But whatever may be the quantity of salt contained in the earth, it is certain that M. Volney's opinion of its coming thither from the air cannot be just. The salt in question is excessively fixed, and cannot be dissipated into the air without the violent heat of a glass-house furnace; and even after this has been done, it will not remain diffused through the atmosphere, but quickly falls back again. No experiments have ever shown that any salt was or could be diffused in the air, except volatile alkali, and this is now known to be formed by the union of two permanently elastic fluids; and it is certain that a saline air would quickly prove fatal to the animals who breathed it. The abundance of this kind of salt in Egypt therefore only shows, that by some unknown operation the heat of the sun forms it from the two ingredients of earth and water, though we do not yet understand the manner, nor are able to imitate this natural operation.

To this saline property of the earth M. Volney ascribes the excessive quickness of vegetation in Egypt, which is so great, that a species of gourd called *kara* will, in 24 hours, send forth shoots of four inches length; but for the same reason, in all probability, it is that no exotic plant will thrive in Egypt. The merchants are obliged annually to send to Malta for their garden seeds; for though the plants thrive very well at first, yet if the seed of them is preserved, and sown a second year, they always come up too tall and slender.

By reason of the great dryness of the air, Egypt is exempted from the phenomena of rain, hail, snow, thunder and lightning. Earthquakes are also seldom heard of in this country; though sometimes they have been very fatal and destructive, particularly one in the year 1112. In the Delta, it never rains in summer,

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Why exotic
plants will
not thrive
in Egypt.

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